

CURRENT GOLDSTRIKE MINE PERMITS AND AUTHORIZATIONS

APPENDIX A

Table A-1 Current Goldstrike Mine Permits and Authorizations

Permit Title	Portion of Operation Covered by Permit	Agency	Period Covered
Programmatic Agreement Regarding the Treatment of Historic Properties	Operation Area	BLM NDHPA Advisory Council on Historic Preservation	1991 to 2011
Spill Prevention Control and Countermeasure Plan	Goldstrike Mine	NA	Updated Every 5 years (Last Updated March 2007)
EIS/ROD – Betze Project	Betze Expansion of Goldstrike	BLM	06-14-91
SEIS/ROD – Betze Project	Dewatering Operations	BLM	04-01-03
POO Authorization/EA/FONSI (#N16-98-002P)	Goldstrike Exploration Project Area	BLM	09-24-99
Reclamation Permit (#0026)	Goldstrike Mine	BLM and BMRR/NDEP	4-16-07 through Mine Closure (Previous Permits Issued 5/91, 4/94, and 1/03)
Mining Bioremediation Facility (General Permit #GNV041995)	Bioremediation Facility	BMRR/NDEP	09-29-95 through Mine Closure
Bioremediation Permit (Individual #GNV041995IHP11)	Facility Roaster	BMRR/NDEP	04-01-99 through Mine Closure
Reclamation Permit (#0030)	Meikle Mine	BMRR/NDEP	12-23-99 through Mine Closure (Amendment to Original Permit Dated 10-92 and 01-93)
Reclamation Permit (#0179)	Goldstrike Exploration	BMRR/NDEP	04-12-99 through Mine Closure
Water Pollution Control Permit (#NEV89068)	Boulder Valley Infiltration Project	BMRR/NDEP	04-09-04 to 04-09-09
Water Pollution Control Permit (#NEV95114)	Boulder Valley Recirculation Project	BMRR/NDEP	Through 2012
Class III Landfill Waiver	Landfill	NDEP	Through Landfill Closure
Injection Well Permit (#NEV 93209)	11 Injection Wells in Boulder Valley	NDEP	11-99 to 11-04 Renewal Submitted, 1-02 acknowledged renewal status
Temporary Authorization to Discharge (#TNEV2008309)	Rodeo Creek Diversion Tributary to Rodeo and Boulder Creeks	NDEP	07-24-07 to 01-24-08
Storm Water Discharges General Permit (# NVR 300000)	Goldstrike Mine	NDEP	06-01-07 to 06-01-12
Water Pollution Control Permit (#NEV0090060)	AA Block/Brush Creek Water Quality Monitoring Locations, Mill 4, Tailings Storage Facilities 1 and 2	NDEP	01-03-07 to 08-18-10

Table A-1 Current Goldstrike Mine Permits and Authorizations

Permit Title	Portion of Operation Covered by Permit	Agency	Period Covered
Water Pollution Control Permit (#NEV91029)	North Block Project	NDEP	10-27-04 to 10-30-09 8-18-07 to 8-17-12
NPDES Permit (#NV0022675)	Boulder Valley Facility	NDEP	08/18/07 to 08/17/2012
Groundwater Discharge Permit and Temporary Authorization to Discharge (#NEV94002)	AA Block, Meikle Mine, and AA Tailings Facility	NDEP	05/07/08 to 05/07/2013
Open Burn Variance	Operation Area	NDEP	As needed
NPDES General Stormwater Permit (#NVR300000)	Operation Area	NDEP	06-01-07 to 06-01-12
Permit to Operate a Public Water System (#EU-5077-12NTNC)	Operation Area	NDEP	08-14-07 to 08-31-08 Renewal submitted
Arsenic Removal Treatment (#EU-5077-TP02-12-NTNC)	Operation Area	NDEP	01-02-28 to 08-28-08 Renewal submitted
Class I Air Quality Permit (Title V) (#AP1041-0739.02)	Entire Facility – Facility ID A0005	NDEP	July 2007 to July 2012
Phase I Mercury OPTC for System 18, Roasters 1 & 2	Process Area	NDEP-BAPC	08-01-06 to 06-16-11
Phase I Mercury OPTC for System 61, Carbon Reactivation Kiln	Process Area	NDEP-BAPC	08-01-06 to 06-16-11
Phase I Mercury OPTC for System 66, AC #1	Process Area	NDEP-BAPC	08-01-06 to 06-16-11
Phase I Mercury OPTC for System 66, AC #2/#3	Process Area	NDEP-BAPC	08-01-06 to 06-16-11
Phase I Mercury OPTC for System 66, AC #4	Process Area	NDEP-BAPC	08-01-06 to 06-16-11
Phase I Mercury OPTC for System 66, AC #5/#6	Process Area	NDEP-BAPC	08-01-06 to 06-16-11
Phase I Mercury OPTC for System 67, Retorts #1, #2, #3	Process Area	NDEP-BAPC	08-01-06 to 06-16-11
Phase I Mercury OPTC for System, 68, East & West Melting Furnaces and Electrowinning Cells	Process Area	NDEP-BAPC	08-01-06 to 06-16-11
Phase I Mercury OPTC for System 15 & 16	Process Area	NDEP-BAPC	08-01-06 to 06-16-11
Phase I Mercury OPTC for System 70, Analytical Laboratory	Process Area	NDEP-BAPC	08-01-06 to 06-16-11

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Permit Title	Portion of Operation Covered by Permit	Agency	Period Covered
February 4, 2008 ten Phase II permit applications for Mercury thermal sources (the sources listed above) were submitted to NDEP BAPC	Process Areas	NDEP-BAPC	Not applicable until approval, anticipated approval 06-16-2011
ROW Occupancy Permit (#EO-47-1999)	Street Sign 7.5 Miles from Mine	NDOT	09-30-99
NDOW Industrial Artificial Pond Permit (#S-26590, Formerly #S-19378)	AA Tailings Facility, Mill Facility	NDOW	04-01-05 to 03-31-10
Dam Construction or Alteration Application (#J-262)	AA Emergency Overflow	NDWR	02-17-87 (Valid for Life of Dam)
Dam Construction or Alteration Application (#J-278)	Goldstrike Tailings Dam	NDWR	02-10-88 (Valid for Life of Dam)
Dam Construction or Alteration Application (#J-309)	Mill 4-1 Tailings Dam	NDWR	02-23-89 (Valid for Life of Dam)
Dam Construction or Alteration Application (#J-320/460)	TS Ranch Dam	NDWR	07-12-96 (Valid for Life of Dam)
Dam Construction or Alteration Application (#J-332)	Rodeo Creek Diversion	NDWR	03-15-90 (Valid for Life of Dam)
Dam Construction or Alteration Application (#J-377, Modified from #J-507)	North Block Emergency Containment Pond	NDWR	03-11-99 (Valid for Life of Dam)
Dam Construction or Alteration Application (#J-489, Formerly #J-448 and #J-394)	North Block Tailings Dam	NDWR	09-21-98 (Valid for Life of Dam)
Dam Construction or Alteration Application (#J-400)	TS Ranch Delivery Pipeline Settlement Pond	NDWR	05-11-93 (Valid for Life of Dam)
Dam Construction or Alteration Application (#J-450)	Boulder Valley North Embankment	NDWR	12-13-95 (Valid for Life of Dam)
Dam Construction or Alteration Application (#J-451)	Boulder Valley Center Embankment	NDWR	12-13-95 (Valid for Life of Dam)
Dam Construction or Alteration Application (#J-452)	Boulder Valley South Embankment	NDWR	12-13-95 (Valid for Life of Dam)
Dam Construction or Alteration Application (#J-466)	TS Ranch Dam – Outlet Piping Alteration	NDWR	11-25-96 (Valid for Life of Dam)
Dam Construction or Alteration Application (#J-506)	Willow Creek Dam – Reconstruction and Alteration	NDWR	03-25-99 (Valid for Life of Dam)
Hazardous Materials	Operations Area	NV State Fire Marshal	03/01/08 to 02/28/09

Table A-1 Current Goldstrike Mine Permits and Authorizations

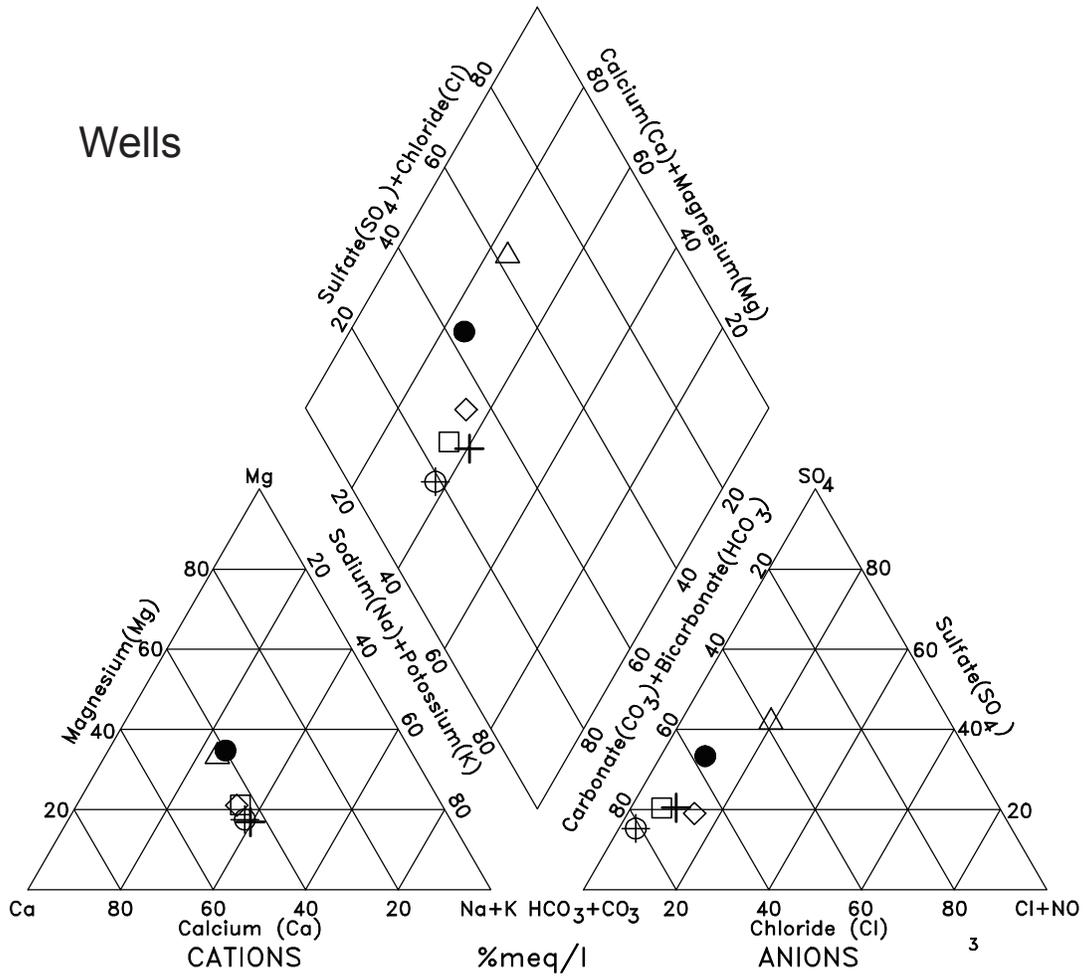
Permit Title	Portion of Operation Covered by Permit	Agency	Period Covered
Jurisdictional Determination	Boulder, Bell, Brush and Rodeo Creeks	USACE	11-20-06 to 11-20-11
Hazardous Materials Certification of Registration	Operations Area	USDOT	06/30/08 to 06/30/2011

Source: BGMI 2007a.

GROUNDWATER RESOURCES AND GEOCHEMISTRY

APPENDIX B

Wells



Legend

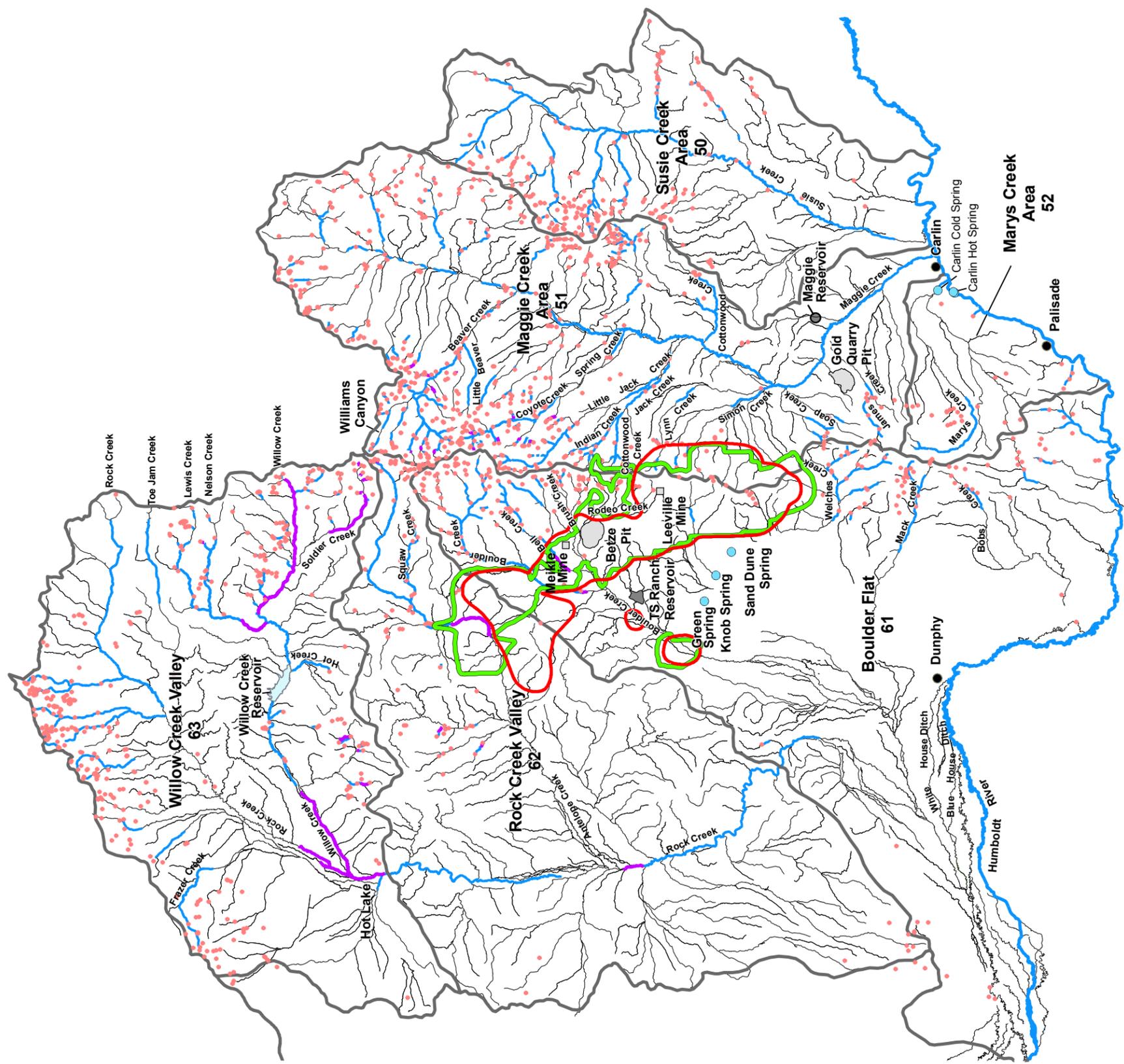
- ◇ Alluvium - Average
- Carlin Formation - Average
- △ Intrusive - Average
- ⊕ Volcanic - Average
- ⊕ Carbonate - Average
- Clastic - Average

Source: BLM 2000a.

Betze Pit Expansion Project

Figure B-2

Piper Trilinear Diagram of Baseline Groundwater Chemistry



- LEGEND**
- 10-Foot Drawdown Contour Expanded Pit (2007)
 - 10-Foot Drawdown Contour, Current Mine Plan (BLM 2000a)
 - Groundwater Basin Boundary
 - Stream (Intermittent or Ephemeral)
 - Perennial Stream
 - Discontinuous Flowing Stream Reach
 - Seeps and Springs

**Betze Pit
Expansion Project**

Figure B-3
Predicted Drawdown
at Recovery
Comparison 2000 to 2007
(Permanent Cone of Depression)



Note: Stream locations are taken from USGS line graph database. Hydrographic Area Boundary locations are approximate.
Source: BLM 2000a; BGM 2007a.

Table B-1 Water Quality Criteria and Standards for Nevada

Parameter ¹ (mg/L)	Drinking Water Standards		Municipal or Domestic Supply	Aquatic Life ²		Agriculture		
	Primary	Secondary		1-Hour Average	96-Hour Average	Irrigation	Stock Water	Wildlife Propagation
Antimony	0.006	--	0.146	--	--	--	--	--
Arsenic	0.05	--	0.05	0.34 As(III)	0.18 As(III)	0.1	0.2	--
Barium	2.0	--	2.0	--	--	--	--	--
Beryllium	0.004	--	0	--	--	0.1	--	--
Boron	--	--	--	--	--	0.75	5.0	--
Cadmium ³	0.005	--	0.005	0.0062 ⁴	0.0015 ⁴	0.01	0.05	--
Chromium	0.1	--	0.10	0.015 Cr(VI)	0.01 Cr(VI)	0.1	1.0	--
Copper ³	1.3	--	--	0.0253 ⁴	0.0161 ⁴	0.2	0.5	--
Iron	--	0.3 [0.6] ⁵	--	1.0	1.0	5.0	--	--
Lead ³	0.05	--	0.05	0.0022 ⁴	0.0016 ⁴	5.0	0.1	--
Magnesium	--		125/150	--	--			
Manganese	--	0.05[0.1]	--	--	--	0.2	--	--
Mercury	0.002	--	0.002	0.002	0.000012	--	0.01	--
Molybdenum	--	--	--	0.019	0.019			
Nickel ³	0.1	--	0.0134	1.919 ⁴	0.213 ⁴	0.2	--	--
Selenium	0.05	--	0.05	0.020	0.005	0.002	0.05	--
Silver	0.05	--	--	0.0089 ⁴	0.0089 ⁴	--	--	--
Thallium	0.002	--	0.013	--	--	--	--	--
Zinc ³	--	5.0	--	0.159 ⁴	0.144 ⁴	2.0	25.0	--
Cyanide (WAD)	--	--	0.2	0.022	0.0052	--	--	--
Alkalinity	--	--	--	Less than 25% change		--	--	30-130
Chloride	--	250[400] ⁵	250[400]	--	--	--	1,500	1,500
Color (PCU)	--	15	75	--	--	--	--	--
Dissolved Oxygen	--	--	Aerobic	5.0	5.0	--	Aerobic	Aerobic
Fluoride	4.0	2.0	--	--	--	1.0	2.0	--
Nitrate as N	10	--	10	90(w) ⁶	90(w)	--	100	100
pH (SU)	--	6.5-8.5	5.0-9.0	6.5-9.0	6.5-9.0	4.5-9.0	5.0-9.0	7.0-9.2
Sulfate	--	250[500]	250[500]	--	--	--	--	--
Temperature °C	--	--	--	Site-specific determination		--	--	--
TDS	--	500[1,000]	500[1,000]	--	--	--	3,000-7,000	--

Table B-1 Water Quality Criteria and Standards for Nevada

Parameter ¹ (mg/L)	Drinking Water Standards		Municipal or Domestic Supply	Aquatic Life ²		Agriculture		
	Primary	Secondary		1-Hour Average	96-Hour Average	Irrigation	Stock Water	Wildlife Propagation
TSS	--	--	--	25-80	25-80	--	--	--
Turbidity (NTU)	--	--	--	50(w);10(c)	50(w); 10(c)	--	--	--

¹ mg/L = milligrams per liter; PCU = photoelectric color units; SU = standard units; NTU = nephelometric turbidity units; TDS = total dissolved solids; TSS = total suspended solids; °C = degrees Celsius.

² Aquatic life standards are presented in mg/L rather than g/L.

³ Dissolved fraction only.

⁴ Parameter dependent on hardness; a hardness value of 175 mg/L was used to calculate the criteria for hardness-dependent metals.

⁵ Numbers in brackets [] are mandatory secondary standards for public water systems.

⁶ (w) refers to warm water and (c) is for cold water. No letter designation indicates criteria are common to both warm and cold water.

Source: NAC 445.119; NAC 445A.144.

Table B-2 Summary of Groundwater Chemistry by Hydrostratigraphic Unit

Constituent	Units	Alluvium				Volcanic				Carlin Formation			
		Number of Wells	Minimum	Maximum	Average	Number of Wells	Minimum	Maximum	Average	Number of Wells	Minimum	Maximum	Average
Physical and Aggregate Properties													
TDS	mg/L	10	160	750	323	20	170	760	375	16	180	630	478
Inorganic Nonmetallic Constituents													
Chloride	mg/L	10	6.7	82	23	20	11.0	64	21	16	4.0	41.0	16.6
Fluoride	mg/L	10	0.24	2.8	0.64	20		3	1.4	16	0.29	1.60	1.14
pH	SU	10	7.0	8.9	7.6	20	3.5	9.3	7.7	16	6.3	9.8	7.4
Sulfate	mg/L	10	20	82	45	20	11.0	180	58	16	29.0	130.0	73.2
Temperature	°C	10	9.0	61.3	12.4	20	12.0	63	24	16	11.0	55.0	38.9
Alkalinity	mg/L	10	67	203	153	20	2.5	440	228	16	100	440	273
Bicarbonate	mg/L	10	82	248	186	20	3.0	536	277	16	122	536	333
Sodium	mg/L	10	17	57	34	20	18.0	92.6	50.9	16	16.0	85.0	58.2
Potassium	mg/L	10	3.3	28	7.3	20	2.4	21	10	16	4.40	35.00	16.61
Calcium	mg/L	10	15.0	75	42	20	15.0	88	53	16	26.0	100.0	74.1
Dissolved Metals/Semi-metals													
Antimony	mg/L	10	0.0025	0.025	0.006	20	0.0020	0.025	0.008	16	<0.019	<0.019	*
Arsenic, Total	mg/L	10	0.002	0.170	0.023	20	0.003	0.21	0.022	16	0.005	0.410	0.027
Boron	mg/L	10	0.05	0.60	0.12	20	0.05	0.84	0.31	16	0.091	1.080	0.685
Iron	mg/L	10	0.005	100	2.8	20	--	59	1.7	16	0.010	220	1.558
Lead	mg/L	10	0.025	0.025	0.02	20	0.025	0.025	0.025	16	0.001	0.310	0.018
Magnesium	mg/L	10	3.7	35	12	20	5.8	30	13	16	10.0	48.0	21.0
Manganese	mg/L	10	0.001	2.8	0.1	20	--	2.9	0.1	16	0.005	2.000	0.036
Mercury	mg/L	10	0.0001	0.0002	0.0001	20	0.00005	0.00015	0.00007	16	0.00010	0.00500	0.00052
Selenium	mg/L	10	0.0025	0.05	0.01	20	0.0025	0.05	0.01	16	0.001	0.007	0.004
Thallium	mg/L	10	0.001	0.0025	0.001	20	0.0025	0.025	0.01	16	0.011	0.210	0.107
Zinc	mg/L	10	0.0025	0.042	0.01	20	0.0025	0.071	0.02	16	0.003	2.200	0.031

Table B-2 Summary of Groundwater Chemistry by Hydrostratigraphic Unit

Constituent	Units	Intrusive				Marine Clastic				Marine Carbonate			
		Number of Wells	Minimum	Maximum	Average	Number of Wells	Minimum	Maximum	Average	Number of Wells	Minimum	Maximum	Average
Physical and Aggregate Properties													
TDS	mg/L	7	270	510	392	13	185	450	305	24	310	672	566.2
Inorganic Nonmetallic Constituents													
Chloride	mg/L	7	4.0	81.0	46.3	13	3.4	69.0	17.0	24	3.0	19	14.9
Fluoride	mg/L	7	0.21	0.90	0.47	13	0.36	0.70	0.50	24	0.6	1.6	1.3
pH	SU	7	6.3	8.9	8.0	13	6.4	9.2	7.6	24	5.1	8	6.7
Sulfate	mg/L	7	45.0	190.0	134.1	13	43.0	190.0	80.4	24	48.0	160	77.0
Temperature	°C	7	11.0	35.0	21.1	13	11.0	40.0	23.5	24	29.0	60	51.3
Alkalinity	Mg/L	7	75	170	127	13	100.0	180	140	24	160.0	480	422.0
Bicarbonate	Mg/L	7	91	207	155	13	122	219	171	24	195.1	585.216	514.5
Sodium	Mg/L	7	20.0	44.0	30.7	13	15.8	36.0	23.6	24	21.0	85.5	73.9
Potassium	Mg/L	7	2.60	8.10	5.51	13	4.40	8.90	6.35	24	6.6	25	20.9
Calcium	Mg/L	7	32.0	80.0	51.8	13	28.0	57.0	38.7	24	39.0	109	88.9
Dissolved Metals/Semi-metals													
Antimony	Mg/L	7	0.039	0.039	0.039	13	<0.019	<0.019	*	24	0.022	0.050	0.035
Arsenic, Total	Mg/L	7	0.020	0.200	0.095	13	0.002	0.570	0.113	24	0.008	0.451	0.021
Boron	Mg/L	7	0.084	0.100	0.094	13	0.047	0.107	0.094	24	0.600	0.847	0.767
Iron	Mg/L	7	0.020	4.300	0.463	13	0.020	3.400	0.468	24	0.030	14.7	0.308
Lead	Mg/L	7	0.001	0.012	0.007	13	0.001	0.007	0.004	24	<0.001	0.012	0.007
Magnesium	Mg/L	7	12.0	38.0	25.5	13	11.0	37.2	20.3	24	19.0	32.0	21.9
Manganese	Mg/L	7	0.002	1.200	0.114	13	0.005	0.342	0.083	24	0.007	0.092	0.013
Mercury	Mg/L	7	0.0001	0.0001	0.000	13	0.00010	0.00028	0.00019	24	0.0001	0.00222	0.0007
Selenium	Mg/L	7	0.006	0.013	0.010	13	0.001	0.001	0.001	24	0.002	0.004	0.004
Thallium	Mg/L	7	0.002	0.002	0.002	13	<0.001	<0.001	*	24	<0.001	<0.001	*
Zinc	Mg/L	7	0.005	0.069	0.017	13	0.005	0.100	0.026	24	0.002	0.180	0.017

*Average below detection limit.

Note: Constituents which exceed Nevada Drinking Water Primary Standards are shown in bold.

Source: BLM 2000a.

Table B-3 Boulder Valley Monitoring Data – First Quarter 2007 – Selected Monitoring Wells and Springs

Parameters ¹	Units	Boulder Valley Monitoring Wells ²													Boulder Valley Springs		
		NA-01A	NA-10	NA-18	NA-22	NA-26	NA-29	NA-32	NA-34	IMW-93-1	IMW-93-2	IMW-93-3	IMW-93-4	IMW-95-1	Sand Dune Spring	Knob Spring	Green Spring
Alkalinity	mg/L	169	254	290	280	109	90.7	141	110	111	119	102	216	207	241	242	262
Aluminum	mg/L	<0.08	<0.08	<0.08	<0.03	<0.08	<0.03	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Antimony	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Arsenic	mg/L	<0.025	0.0377	0.0329	0.04	0.0078	<0.025	0.0066	0.0109	<0.025	<0.025	0.0034	0.0085	0.0106	0.0115	0.0111	0.0119
Barium	mg/L	0.064	0.0561	0.0599	0.069	0.0737	0.025	0.0819	0.0843	0.0221	0.0713	0.0751	0.0714	0.0622	0.0854	0.0791	0.104
Beryllium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Bicarbonate	mg/L	169	254	290	280	109	90.7	141	110	87.8	119	102	216	195	241	235	253
Boron	mg/L	0.08	0.53	0.47	0.54	0.11	0.11	0.12	0.1	0.2	0.12	0.25	0.31	0.21	0.25	0.24	0.29
Cadmium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L	36.7	56	76.1	63.1	22.8	27.6	33.9	29.7	3.21	36.5	18	56.9	41.5	57	56.5	58.4
Carbonate	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	23	<1.0	<1.0	<1.0	12.2	<1.0	6.7	9.4
Chloride	mg/L	28.7	21.7	20	34.2	10.3	28.6	10.9	9.65	40.6	22.8	36.8	18.6	15.4	15.4	14.6	17.6
Chromium	mg/L	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Copper	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Conductivity	µmho/cm	463	704	721	833	286	391	361	302	346	366	404	584	453	607	487	641
Fluoride	mg/L	0.83	1.14	1.13	2.15	0.99	2.16	0.56	0.54	2.03	0.56	1.38	1.38	2.08	2.35	2.94	2.59
Iron	mg/L	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.15	<0.06	0.08	<0.06	<0.06	<0.06
Lead	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Magnesium	mg/L	9.25	15.5	17.9	14.6	4.83	5.04	8.88	6.15	2.95	6.54	7.68	12.9	9.03	15.9	13	15
Manganese	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004	0.009	<0.004	<0.004	<0.004	<0.004	0.013	<0.004	0.017	<0.004	0.01	0.008
Mercury	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Table B-3 Boulder Valley Monitoring Data – First Quarter 2007 – Selected Monitoring Wells and Springs

Parameters ¹	Units	Boulder Valley Monitoring Wells ²													Boulder Valley Springs		
		NA-01A	NA-10	NA-18	NA-22	NA-26	NA-29	NA-32	NA-34	IMW-93-1	IMW-93-2	IMW-93-3	IMW-93-4	IMW-95-1	Sand Dune Spring	Knob Spring	Green Spring
Nickel	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrite-Nitrate	mg/L	1.47	0.765	0.897	0.66	0.82	4.06	1.05	0.789	<0.02	2.73	<0.02	1.06	0.042	<0.03	0.371	0.466
pH	SU	7.57	7.52	7.47	7.61	7.67	7.95	7.31	7.45	9.13	7.62	8.27	7.32	8.5	8.04	8.34	8.38
Potassium	mg/L	4.39	13.3	9.86	8.63	4.69	4.09	5.97	5.6	8.37	5.1	8.12	9.66	9.26	9.93	9.91	11.4
Selenium	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Silver	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Sodium	mg/L	52.2	68.2	55.7	91.6	25.1	38.9	23.1	17.9	59.2	28.9	51.1	37.8	39.7	35.4	36.5	42.9
Sulfate	mg/L	31.9	88.1	68.2	94.2	27.9	35.4	29.8	26.7	<0.3	27.7	50.5	57.5	16.6	47.5	43.3	50.6
Temperature	°C	10.6	14.3	15.6	15	14.6	25.3	12.3	12.8	15.6	14.8	13.8	14.7	14.5	24.2	18.9	16.7
Thallium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
TDS	mg/L	289	431	440	571	187	230	249	211	159	238	229	372	281	357	350	286
Water Level	feet bgs	181.7	399.7	387.31	197.59	82.29	875.56	31.56	17.03	313.06	210.17	55.3	57.37	62.71			
Zinc	mg/L	<0.01	0.027	<0.01	<0.01	<0.01	0.101	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

¹All metals reported as dissolved.

²Groundwater wells shown on **Figure 3.3-2**.

Note: Constituents which exceed Nevada Drinking Water Primary Standards are shown in bold.

µmho = micromoho

bgs = below ground surface

Source: Data from Feb/March 2007 (BGMI 2007f).

Table B-4 Summary of Betze Seeps and Springs Sampling Sites

Catchment	Waterbody Type	Sampling Site	Date Sampled/ Visited	Elevation (feet)	Location (Latitude & Longitude)		2006 Survey Notes
Upper Rodeo Creek Catchment	Springs	117	9/27/06	6,000	40°58.267'	116°19.533'	Trickle flow, not measurable; vegetation comparable to previous years.
		121	9/27/2006	6,200	40°57.443'	116°19.127'	Very low flow; vegetation comparable to previous years. Evidence of use of this site by elk.
		126	9/27/2006	6,206	40°57.019'	116°19.276'	Highest flow recorded during monitoring period, the sampling location was moved from its original site to about 100 years downstream (as during 1999 sampling); vegetation comparable to previous years. Evidence of elk utilization at this site, but less than at Site 121.
Brush Creek Catchment	Creek	BC	NA	5,400	40°59.383'	116°21.933'	Site dramatically disturbed by mining activities in 2004. Site removed from monitoring program in 2006.
		93	9/27/2006	5,917	40°59.400'	116°19.617'	Limited trickle flow, flyover; vegetation comparable to previous years.
	Springs	98	9/27/2006	6,200	40°59.142'	116°18.998'	Very low flow; vegetation comparable to previous years.
		100	9/27/2006	6,199	40°59.328'	116°18.825'	Very low flow; vegetation comparable to previous years.

Table B-4 Summary of Betze Seeps and Springs Sampling Sites

Catchment	Waterbody Type	Sampling Site	Date Sampled/ Visited	Elevation (feet)	Location (Latitude & Longitude)		2006 Survey Notes
Bell Creek Catchment	Springs	70B	9/26/2006	5,795	41°02.065'	116°21.700'	Low flow; Site lightly grazed; vegetation comparable to other years.
		74	9/26/2006	6,768	41°02.550'	116°19.045'	Low flow; Site moderately grazed; vegetation cover somewhat lower than previous years, when the site was not grazed.
Boulder Creek Catchment	Springs	55	9/26/2006	6,861	41°03.782'	116°19.025'	Low flow; site heavily grazed; vegetation cover comparable to previous years when the site was grazed. Stream bank undercutting may result in slope failure near the transect starting point.
		19	9/26/2006	7,000	41°06.431'	116°18.477'	Trickle flow but highest on record, with most flow below armoring rocks; Site heavily grazed; vegetation cover lower than previous years.
		A2	9/26/2006	7,423	41°06.333'	116°19.833'	Limited flow, flyover only; vegetation as site comparable to previous years.
		24	9/26/2006	7,196	41°05.891'	116°18.789'	Low flow but highest on record; site grazed – vegetation cover values comparable to other years when the site has been grazed.
		6	9/26/2006	5,400	41°00.040'	116°25.487'	Dry, vegetation comparable to the past 6 years. General trend of decreasing total vegetation cover; Site heavily grazed.
		88	9/26/2006	5,400	40°59.417'	116°25.667'	Dry, flyover only; site comparable to previous years.

Table B-4 Summary of Betze Seeps and Springs Sampling Sites

Catchment	Waterbody Type	Sampling Site	Date Sampled/ Visited	Elevation (feet)	Location (Latitude & Longitude)		2006 Survey Notes
Indian Creek Catchment	Springs	111	9/27/2006	6,000	40°58.160'	116°16.360'	Moderate flow; not as much watercress as in previous years. Some bank undercutting upstream of water sampling site; site heavily grazed.
		104	9/27/2006	6,390	40°59.665'	116°17.301'	Low flow; limited grazing; vegetation comparable to previous years.
Beaver Creek Catchment	Springs	A1	9/26/2006	7,625	41°06.471'	116°17.853'	Trickle flow; vegetation at transect heavily grazed – comparable to earlier years when the site has been grazed.
Rock Creek Catchment	Creek	RKC-1	9/25/2006	4,955	41°02.954'	116°43.398'	Flow close to historic mean; vegetation lightly grazed; substantial growth of coyote willows. Evidence of high flows earlier in the growing season.
		RKC-2	9/25/2006	4,870	40°57.447'	116°42.721'	Flow close to historic mean; the sampling location was moved from its previous site about 150 yards downstream; site heavily grazed but comparable to previous years.
		RKC-3	9/25/2006	4,810	40°53.286'	116°41.339'	Flow close to historic mean; site lightly grazed but comparable to previous years; evidence of high flows earlier in the growing season; adjacent vegetation burned in 2006.
		RKC-4	9/25/2006	4,680	40°49.568'	116°35.196'	Flow close to historic mean; vegetation comparable to previous years.

Table B-4 Summary of Betze Seeps and Springs Sampling Sites

Catchment	Waterbody Type	Sampling Site	Date Sampled/ Visited	Elevation (feet)	Location (Latitude & Longitude)		2006 Survey Notes
Antelope Creek Catchment	Springs	S38-49-28A	9/26/2006	5,619	41°08.302'	116°27.249'	Very low flow but highest on record; significant algae growth; site only lightly grazed; more vegetation cover than in 2005.
		S38-49-34A	9/26/2006	5,600	41°07.150'	116°25.936'	Similar flow conditions compared with last year; vegetation comparable to previous years.
		S37-49-08L	9/25/2006	5,390	41°06.064'	116°27.911'	Highest flow on record. Water conditions comparable to 2005, but less vegetation cover. More grazing in 2006.
	Creek	ANT-1	9/25/2006	5,315	41°04.506'	116°27.404'	Highest flow on record; heavily grazed. Original transect site covered with sediment deposited in association with high stream flows in 2005. New transect location selected and sampled. 2006 conditions comparable to 2005.
		ANT-2	9/25/2006	5,065	41°02.234'	116°33.934'	Dry, flyover only; dry channel – only scattered plants.
		ANT-3	9/25/2006	4,925	40°59.945'	116°39.388'	Lowest flow on record – heavily grazed. Major species is water speed in the channel. Very little development of riparian vegetation.

Table B-4 Summary of Betze Seeps and Springs Sampling Sites

Catchment	Waterbody Type	Sampling Site	Date Sampled/ Visited	Elevation (feet)	Location (Latitude & Longitude)		2006 Survey Notes
Outlying Seeps and Springs in the northern extreme of the Sheep Creek Range	Springs	S37-48-19A	9/25/2006	5,438	41°04.264'	116°35.850'	Highest flow on record; vegetation cover much higher than any previous year. No grazing. God development of wetland vegetation. Upland areas burned in 2006.
		S37-48-21L	9/25/2006	5,698	41°05.338'	116°35.321'	Highest flow on record; Site heavily grazed and trampled by livestock. Upland areas burned in 2006; sampling directly from spring containment unit.
		S38-48-19A	9/25/2006	5,857	41°09.312'	116°35.059'	No measurable flow; site not grazed in 2006; more vegetation cover than in 2005.
		S38-48-11A	9/26/2006	5,509	41°10.975'	116°30.502'	Highest flow on record; vegetation cover higher than previous years; site not grazed. Water cress abundant in stream channel.
		S39-48-31A	9/26/2006	5,240	41°13.053'	116°36.124'	Similar flow conditions compared with past observations; vegetation cover comparable to previous years; site lightly grazed. Water cress abundant in stream channel.
		S39-48-31B	9/26/2006	5,287	41°13.069'	116°35.979'	Similar flow conditions compared with past observations; Site saturated and muddy in portions closest to seep; not grazed in 2006.
		S39-48-33A	9/26/2006	5,476	41°13.151'	116°33.006'	Similar flow conditions compared with past observations; not grazed in 2006; comparable species composition; grass and cobble bed.

Source: AATA 2007; JBR 1992a; RTi 1994.

Table B-5 Field Survey Form – Fall 2006 Betze Seep and Spring Study

Location Site	Upper Rodeo Creek Catchment		Brush Creek Catchment		Bell Creek Catchment	
	121	126	98	100	70B	74
Date	9/27/2006	9/27/2006	9/27/2006	9/27/2006	9/26/2006	9/26/2006
Water Temperature (°C)	7.8	10.6	8.1	11.3	16.7	17.5
Discharge (gpm)	0.26	2.37	0.66	0.10	7.50	4.87
Discharge (cfs)	0.0006	0.0053	0.0015	0.0002	0.0167	0.0108
TDS mg/L	244.5	262.3	477.5	441.7	252.6	148.6
Conductivity (µS)	345.7	372.7	670.9	621.5	365.8	216.9
pH	6.9	7.56	7.69	6.91	6.83	7.44

Location Site	Boulder Creek Catchment			Beaver Creek Catchment	Indian Creek Catchment	
	19	24	55	A1	104	111
Date	9/27/2006	9/27/2006	9/27/2006	9/27/2006	9/26/2006	9/26/2006
Water Temperature (°C)	17.5	16.0	12.7	18.0	9.7	13.5
Discharge (gpm)	0.44	2.20	7.55	0.56	3.24	83.88
Discharge (cfs)	0.0010	0.0049	0.0168	0.0013	0.0072	0.1872
TDS mg/L	60.44	96.70	195.7	44.96	256.9	233.9
Conductivity (µS)	89.5	143.4	283.1	67.34	367.6	336.1
pH	7.14	7.61	7.38	7.59	7.92	7.74

Location Site	Rock Creek Catchment			
	RKC-1	RKC-2	RKC-3	RKC-4
Date	9/25/2006	9/25/2006	9/25/2006	9/25/2006
Water Temperature (°C)	13.5	14.3	11.6	10.5
Discharge (gpm)	2321.57	2309.34	3787.34	3779.21
Discharge (cfs)	5.1725	5.1452	8.4383	8.4201
TDS mg/L	232.9	222.1	229.3	227.4
Conductivity (µS)	339.3	320.8	328.9	325.4
pH	8.30	8.51	8.42	7.73

Table B-5 Field Survey Form – Fall 2006 Betze Seep and Spring Study

Location Site	Antelope Creek Catchment				
	S38-49-28A	S38-49-34A	S37-49-08L	ANT-1B	ANT-3
Date	9/26/2006	9/26/2006	9/25/2006	9/25/2006	9/25/2006
Water Temperature (°C)	15.8	18.2	20.4	18.8	20.9
Discharge (gpm)	0.99	6.91	271.77	281.93	2.82
Discharge (cfs)	0.0022	0.0154	0.6065	0.6292	0.0063
TDS mg/L	197.4	299.7	404.6	414.5	306.1
Conductivity (µS)	287.5	430.6	583.5	592.6	444.9
pH	7.48	7.27	8.13	8.40	8.09

Location Site	North Extreme of the Sheep Creek Range					
	S37-48-19A	S37-48-21L	S38-48-11A	S39-48-31A	S39-48-31B	S39-48-33A
Date	9/25/2006	9/25/2006	9/26/2006	9/26/2006	9/26/2006	9/26/2006
Water Temperature (°C)	16.3	17.3	18.7	6.5	13.1	15.5
Discharge (gpm)	20.47	11.08	214.73	5.06	32.49	30.80
Discharge (cfs)	0.0456	0.0247	0.4792	0.0113	0.0722	0.0685
TDS mg/L	420.2	300.1	123.4	183	171.6	126.4
Conductivity (µS)	615	433.7	182.1	260.7	249.5	184.9
pH	7.40	7.35	7.71	6.78	7.34	7.83

Source: AATA 2007.

Table B-6 Chemical Analysis Results of the Betze Seeps and Springs Survey (2006)

Site	TDS mg/L	Conductivity µmho/cm	pH SU	As ¹ mg/L	B ¹ mg/L	Fe ¹ mg/L	Mn ¹ mg/L	Total P mg/L	CO ₃ mg/L	HCO ₃ mg/L	Cl mg/L	F mg/L	SO ₄ mg/L	Ca mg/L	K mg/L	Mg mg/L	Na mg/L	TSS mg/L	Alkalinity mg/L
A1	44.96	67.3	7.6	<0.003	<0.04	0.23	0.008	0.02	<1.0	16.6	0.6	<0.10	2.44	2.96	2.31	0.94	3.57	<5	16.6
19	60.44	89.5	7.1	<0.003	0.05	0.30	0.023	0.13	<1.0	37.5	1.9	<0.10	4.91	7.85	2.77	2.50	6.44	28	37.5
24	96.70	143.4	7.6	<0.003	<0.04	0.21	0.008	0.20	<1.0	62.0	2.5	0.15	8.93	15.10	2.62	5.90	5.91	15	62.0
55	195.70	283.1	7.4	<0.003	<0.04	0.11	0.106	0.10	<1.0	64.1	3.0	0.20	71.40	30.10	2.41	13.00	7.23	<5	64.1
70B	252.60	365.8	6.8	<0.003	0.08	0.17	0.443	0.26	<1.0	127.0	7.4	0.29	58.509	38.60	8.03	15.10	14.30	5	127.0
74	148.60	216.9	7.4	<0.003	<0.04	0.08	0.011	0.53	<1.0	74.7	2.3	0.15	32.80	23.10	2.25	8.78	6.92	73	74.7
98	477.50	670.9	7.7	<0.003	<0.04	<0.06	0.534	0.23	<1.0	235.0	5.1	0.44	138.00	80.80	2.58	38.60	15.50	12	235.0
100	441.70	621.5	6.9	0.0038	0.05	<0.06	<0.004	0.37	<1.0	170.0	9.6	0.31	154.00	71.30	4.13	31.40	22.00	<5	170.0
104	256.90	367.6	7.9	<0.003	<0.04	<0.06	<0.004	0.17	<1.0	142.0	2.6	0.18	54.80	40.60	2.38	21.00	7.63	16	142.0
111	233.90	336.1	7.7	<0.003	<0.04	<0.06	0.006	0.18	<1.0	129.0	3.3	0.38	47.30	36.50	2.28	19.80	6.74	<5	129.0
121	244.50	345.7	6.9	0.0042	0.05	<0.06	0.034	0.07	<1.0	25.7	7.3	0.31	128.00	29.00	5.28	16.20	10.80	<5	25.7
126	262.30	372.7	7.6	0.0781	0.08	<0.06	0.028	0.14	<1.0	117.0	8.0	0.57	67.00	39.90	5.51	14.10	16.50	23	117.0
RKC-1	232.90	339.3	8.3	0.0067	0.08	0.17	0.024	0.15	2.1	121.0	18.4	0.29	29.30	28.70	6.22	7.31	30.90	13	123.0
RKC-2	222.10	320.8	8.5	0.0076	0.09	0.296	0.038	0.23	<1.0	126.0	16.9	0.27	27.10	28.00	6.70	7.34	34.40	79	126.0
RKC-3	229.30	328.9	8.4	0.0083	0.09	0.17	0.025	0.18	5.0	120.0	17.6	0.30	26.10	29.70	6.41	7.26	30.50	9	125.0
RKC-4	227.40	325.4	7.7	0.0080	0.09	<0.17	0.017	0.19	<1.0	121.0	17.7	0.39	26.50	29.50	5.98	7.32	28.60	15	121.0
S37-48-21L	300.10	433.7	7.4	0.0432	0.11	<0.06	<0.004	0.02	<1.0	150.0	21.5	0.62	29.70	41.10	3.15	8.52	38.90	<5	150.0
S37-48-19A	420.2	615.0	7.4	0.0122	0.13	<0.06	0.006	0.02	<1.0	19.0	45.7	0.50	50.60	73.30	4.50	11.00	41.90	<5	199.0
S37-49-08L	404.60	583.5	8.1	0.053	0.13	<0.06	0.033	0.020	4.7	176.0	36.3	0.56	76.40	46.50	9.61	16.40	50.80	17	181.0
S38-48-11A	124.40	182.1	7.7	<0.003	0.06	<0.06	<0.003	0.05	<1.0	53.5	11.0	0.47	14.30	14.50	3.,20	2.95	18.30	6	53.5
S38-49-28A	197.40	287.5	7.5	<0.003	0.05	<0.06	<0.004	0.01	<1.0	101.0	10.0	0.39	32.10	24.60	5.50	7.78	23.70	<5	101.0
S38-49-34A	299.70	430.6	7.3	<0.003	0.08	<0.06	0.005	<0.010	<1.0	154.0	14.9	0.47	57.30	33.90	5.94	13.50	37.00	<5	154.0

Table B-6 Chemical Analysis Results of the Betze Seeps and Springs Survey (2006)

Site	TDS mg/L	Conductivity µmho/cm	pH SU	As ¹ mg/L	B ¹ mg/L	Fe ¹ mg/L	Mn ¹ mg/L	Total P mg/L	CO ₃ mg/L	HCO ₃ mg/L	Cl mg/L	F mg/L	SO ₄ mg/L	Ca mg/L	K mg/L	Mg mg/L	Na mg/L	TSS mg/L	Alkalinity mg/L
S39-48-31A	183.00	260.7	6.8	<0.003	0.06	<0.06	<0.004	0.02	<1.0	62.9	21.3	0.95	24.50	20.10	3.25	4.01	25.50	<5	62.9
S39-48-31B	171.60	249.5	7.3	<0.003	0.07	0.06	0.006	0.03	<1.0	59.4	19.3	0.94	21.20	19.70	3.05	3.77	23.50	28	59.4
S39-48-33A	126.40	184.9	7.8	<0.003	0.07	<0.06	<0.004	0.01	<1.0	49.0	14.6	1.33	15.10	14.80	2.08	2.84	15.40	5	49.0
ANT-1B	414.50	592.6	8.4	0.0051	0.11	0.06	0.023	0.17	9.0	179.0	33.2	0.39	77.40	49.90	8.79	18.10	52.50	18	188.0
ANT-3	306.10	444.9	8.1	0.0125	0.11	<0.06	0.011	0.07	12.8	180.0	15.4	0.42	29.20	45.80	6.95	10.40	36.70	<5	193.0

¹Concentrations of As, B, Fe, and Mn are dissolved.

Note: Constituents which exceed Nevada Drinking Water Primary Standards are shown in bold.

Source: AATA 2007.

Table B-7 Representative Water Chemistry Input Values for Simulating Rainfall, Carbonate Groundwater, Carlin Groundwater, and Rodeo Creek Water

Representative Water	Station	Sample Date	Temperature (°C)	Total Suspended Solids (mg/L)	pH (SU)	Electrical Conductivity (us/cm)	Total Dissolved Solids (mg/L)	Alkalinity mg/L	Calcium Dissolved (mg/L)	Magnesium Dissolved (mg/L)	Sodium Dissolved (mg/L)
Carbonate	BW-36	12/12/07	53.3		7.35	1370	585	402	92.4	23	74.5
Carlin	PPW-58	12/20/95	22		8.00		423	172.4	48.8	19.3	30.7
Rainfall	Site ID:NV01	1984 to 1998			5.14	6.05			0.175	0.029	0.125
Rodeo Creek	RC-A	04/22/93	10	42	8.39	850	621.5	140	120	37	62

Representative Water	Potassium Dissolved (mg/L)	Bicarbonate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Boron Dissolved (mg/L)	Fluoride (mg/L)	Ammonium Ion (mg/L)	Nitrite-Nitrate (mg/L)	Phosphorus Total (mg/L)
Carbonate	21.2	402	73.3	14.8	0.75	1.36		<0.020	
Carlin	12.9	172.4	76.9	17.5	< 0.01	0.29	< 0.1	0.64	0.07
Rainfall	0.02		0.43	0.13			0.08	0.62	
Rodeo Creek	6.9	85.4	150	160	0.2	< 0.5	< 0.2	13	0.26

Source: Schafer 2007.

Table B-7 Representative Water Chemistry Input Values for Simulating Rainfall, Carbonate Groundwater, Carlin Groundwater, and Rodeo Creek Water

Representative Water	Aluminum Dissolved (mg/L)	Antimony Dissolved (mg/L)	Arsenic Dissolved (mg/L)	Barium Dissolved (mg/L)	Beryllium Dissolved (mg/L)	Cadmium Dissolved (mg/L)	Chromium Dissolved (mg/L)	Copper Dissolved (mg/L)	Iron Dissolved (mg/L)
Carbonate	<0.080	0.0037	0.076	0.157	<0.0020	<0.0020	<0.0060	<0.010	0.134
Carlin	< 0.02	< 0.01	0.01	0.05	< 0.001	< 0.0024	< 0.005	< 0.003	< 0.02
Rainfall			0.001						
Rodeo Creek	< 0.1		0.15	0.16		< 0.005	< 0.005	< 0.005	0.02

Representative Water	Lead Dissolved (mg/L)	Manganese Dissolved (mg/L)	Mercury Dissolved (mg/L)	Nickel Dissolved (mg/L)	Selenium Dissolved (mg/L)	Silicon Dissolved (mg/L)	Silver Dissolved (mg/L)	Thallium Dissolved (mg/L)	Zinc Dissolved (mg/L)
Carbonate	<0.0030	0.017	<0.00020	<0.010	<0.0030	18.5	<0.0050	<0.0020	<0.010
Carlin	< 0.001	< 0.001	< 0.0002	< 0.01	< 0.01	36.4	< 0.003	< 0.001	< 0.002
Rainfall									
Rodeo Creek	< 0.005	0.16	0.0004		< 0.005	18	< 0.005		0.08

Source: Schafer 2007

Summary of changes to the Barrick Goldstrike Hydrologic Model

Memo from J. Zhan, BGMI Senior Hydrologist in Support of Betze Pit Expansion SEIS

Dec 5, 2007

Since the 2003 Betze Project SEIS model, development and calibration of the Barrick Goldstrike Hydrologic Model have continued, as 1) simulation of new scenarios and generation of new results have revealed modifications to be made, and 2) additional data have become available to improve model calibration.

Modifications

The model has been modified to correct a few unrealistic results caused by dry cells. Some examples follow.

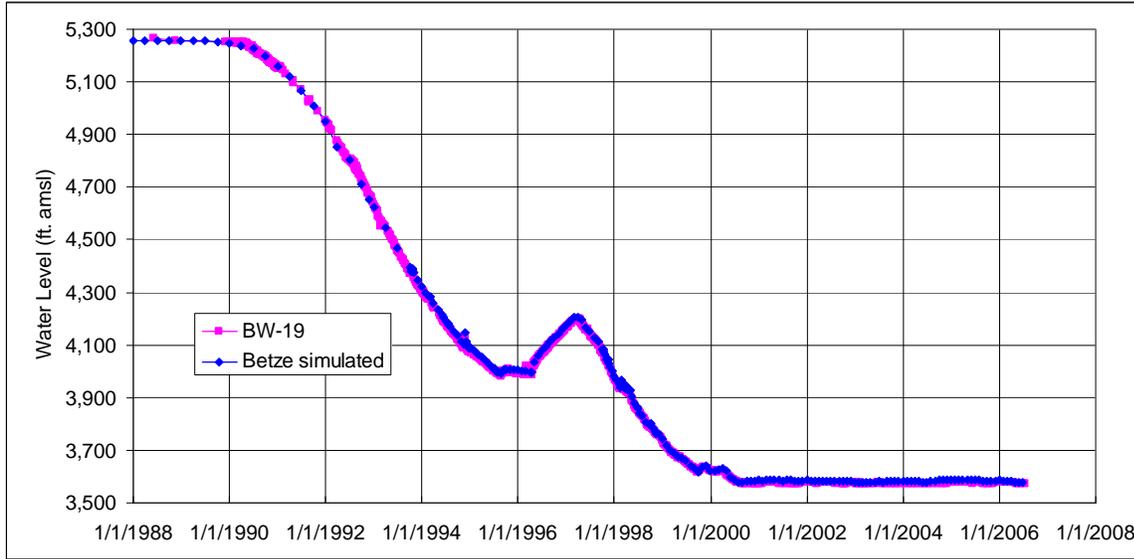
- One example was the alluvium/Carlin formation overlying the layer 2 carbonate and adjacent to the layer 1 carbonate. The drying of layer 1 of the Betze carbonate aquifer cut off some flow paths in the model, causing some water levels to rise as the carbonate water level continued to fall. As layer 1 was rewet during the recovery simulation, the same adjacent, fully recovered formations would then contribute unrealistic slugs of water to the pit. The situation was corrected by the addition of a horizontal flow barrier separating the alluvium/Carlin from the layer 1 carbonate. By preventing horizontal flow the model effectively represents the thinning of the alluvium/Carlin near the carbonate outcrop, improving the previous representation of the unit as a rectangular block. The model now correctly represents flow between the carbonate and alluvium/Carlin as an entirely vertical phenomenon.
- Another example is the connection between the Betze carbonate and the Leeville carbonate through the granodiorrite stock. The permeable window through the stock was moved from layers 1 and 2 to layer 3, correcting the sudden decrease in the connection that occurred when cells in the Betze carbonate became dry.
- Deeper dewatering scenarios resulted in the drying of layer 2 of the Betze carbonate aquifer, which substantially changed the model topology and yielded unrealistic results. The solution was to lower the bottom of layer 2 so that it would not become dry.

The currently model produces very similar results to the 2003 Betze Project SEIS model but has better accuracy.

Ongoing Calibration

Model calibration in the Betze carbonate aquifer has been refined several times, incorporating new water level and pumping data as the aquifer has been stressed down to the 3600 foot elevation (BGMI coordinate). The long term dewatering has continued to provide information about conductivity and storage at deeper levels within the carbonate and of conductivity and storage in hydrogeologic units farther away from the carbonate aquifer. The most recent calibration of the model to Betze carbonate pumping and water levels through June 2006 is presented in Figure 1.

Figure 1. Measured and simulated water levels, Betze carbonate



Model calibration to water levels in the volcanic aquifer and discharge from the Sand Dune Springs has been refined several times, incorporating new data as the injection of water at the TS Ranch Reservoir has continued. The most recent calibration of the model to Sand Dune springflow through June 2006 is presented on Figure 2, with calibration to the associated volcanic water levels presented in Figure 3.

Figure 2. Measured and simulated Sand Dune spring discharge

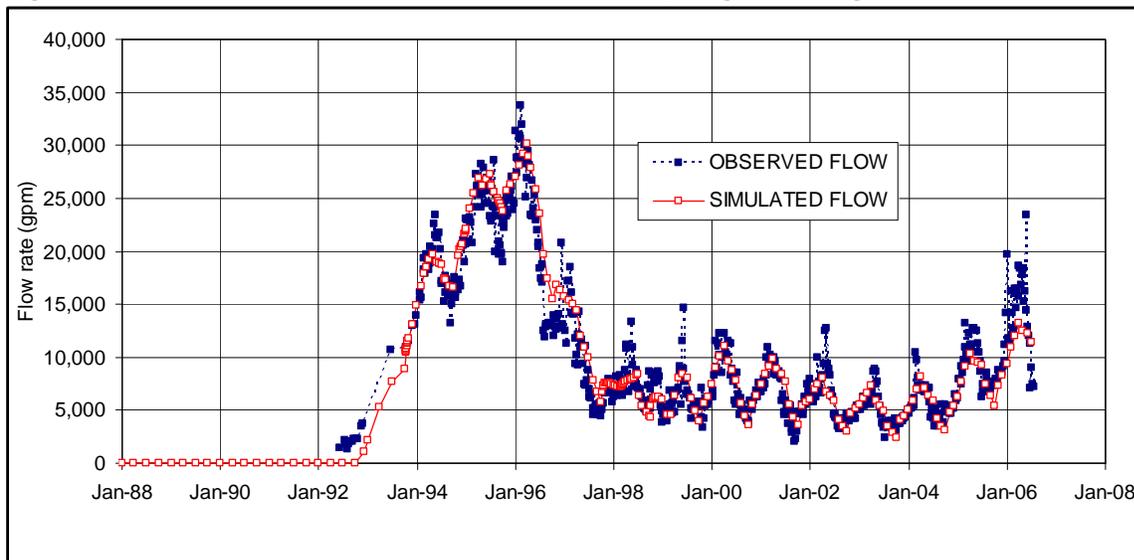
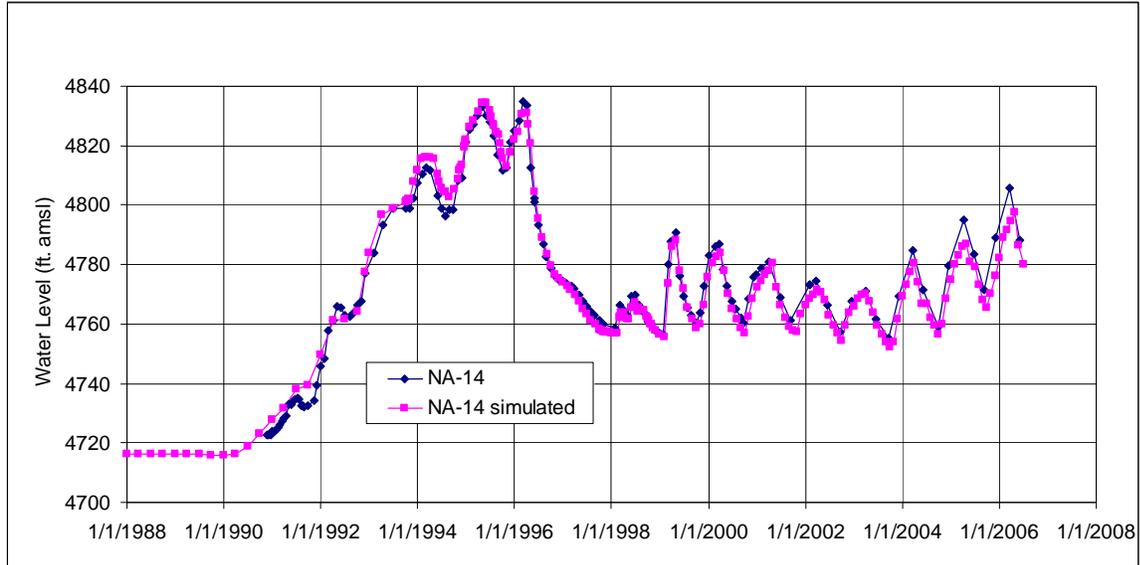
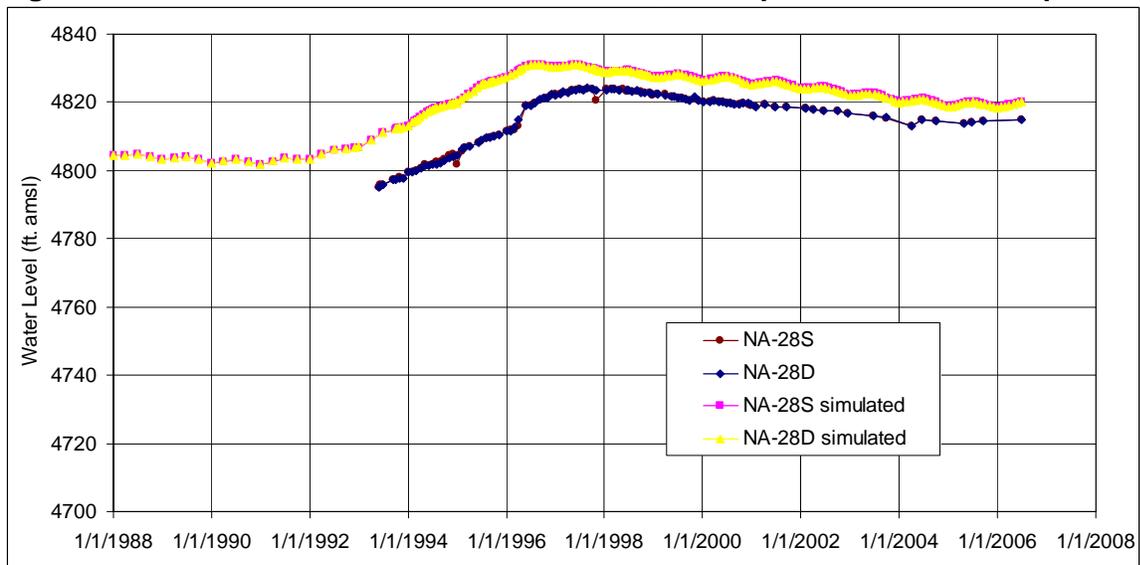


Figure 3. Measured and simulated water levels, Boulder Valley volcanic aquifer



The model has been refined and improved to the northwest of the Goldstrike Mine, toward Antelope Creek, as the complicated interrelation between the Betze carbonate, the Antelope Creek and Boulder Valley volcanic aquifers, and the perched aquifer has become better understood. The carbonate unit dips to the northwest and is overlain by the perched aquifer, coming into hydraulic connection with the volcanic aquifer near Antelope Creek. The Antelope Creek volcanic unit is connected at depth to the Boulder Valley volcanic unit, forming a single aquifer that crosses under the Sheep Creek Range. The most recent calibration of the model to Antelope Creek volcanic water levels through June 2006 is presented in Figure 4.

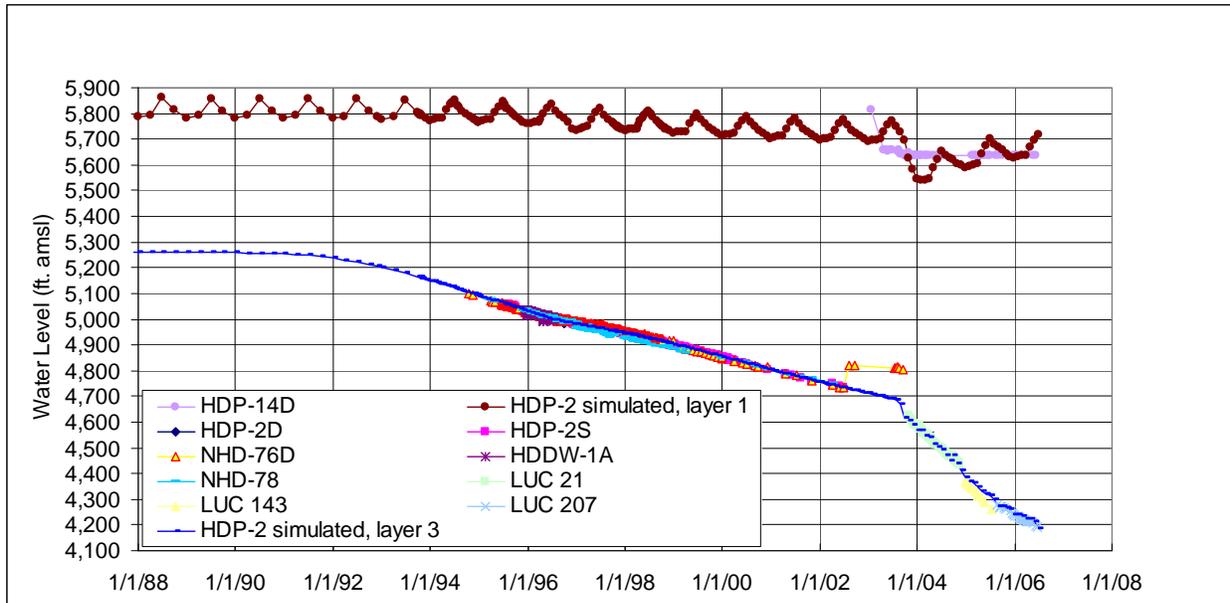
Figure 4. Measured and simulated water levels, Antelope Creek volcanic aquifer



The model has been further developed in the vicinity of the Leeville project as geological information and pumping and water level data have become available. The most recent

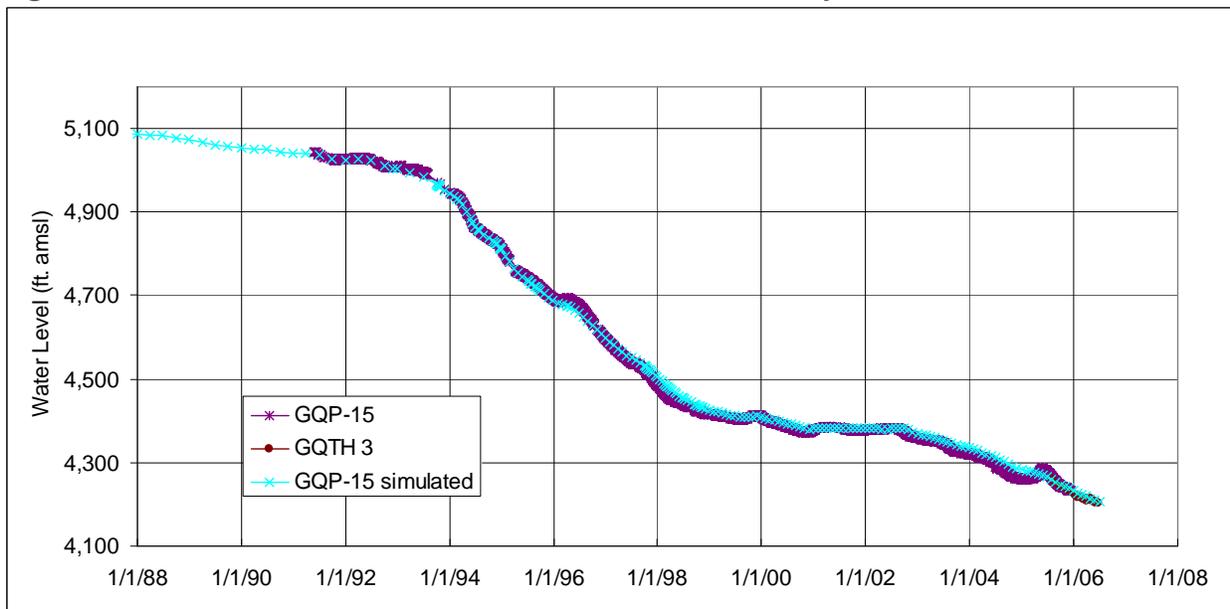
calibration of the model to water levels in the Leeville area through June 2006 is presented in Figure 5.

Figure 5. Measured and simulated water levels, Leeville Mine



The model calibration in the vicinity of Gold Quarry and in the Maggie Creek Basin has been improved, incorporating updated pumping and water level data. The most recent calibration of the model to water levels at Gold Quarry through June 2006 is presented on Figure 6.

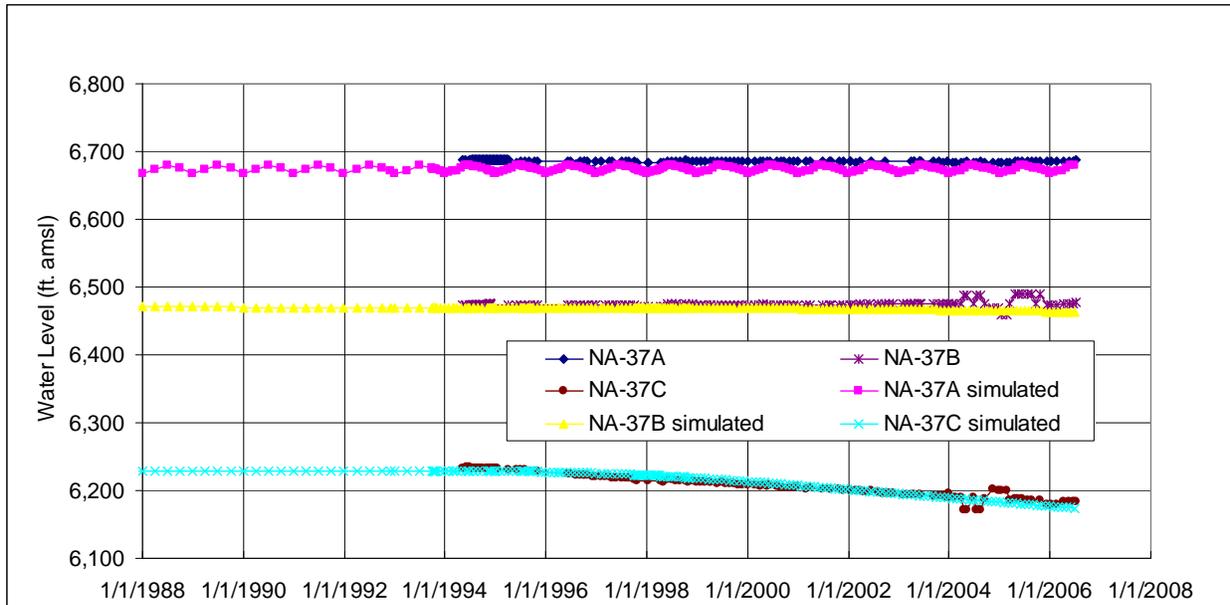
Figure 6. Measured and simulated water levels, Gold Quarry



Continued measurement of water levels in the Tuscarora Mountains has led to recalibration and improvement of the model in this area. The most recent calibration of the model to water levels

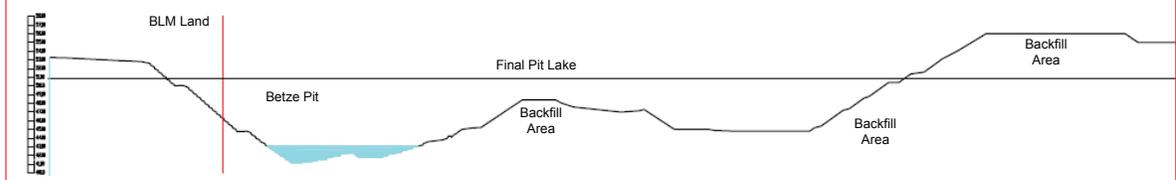
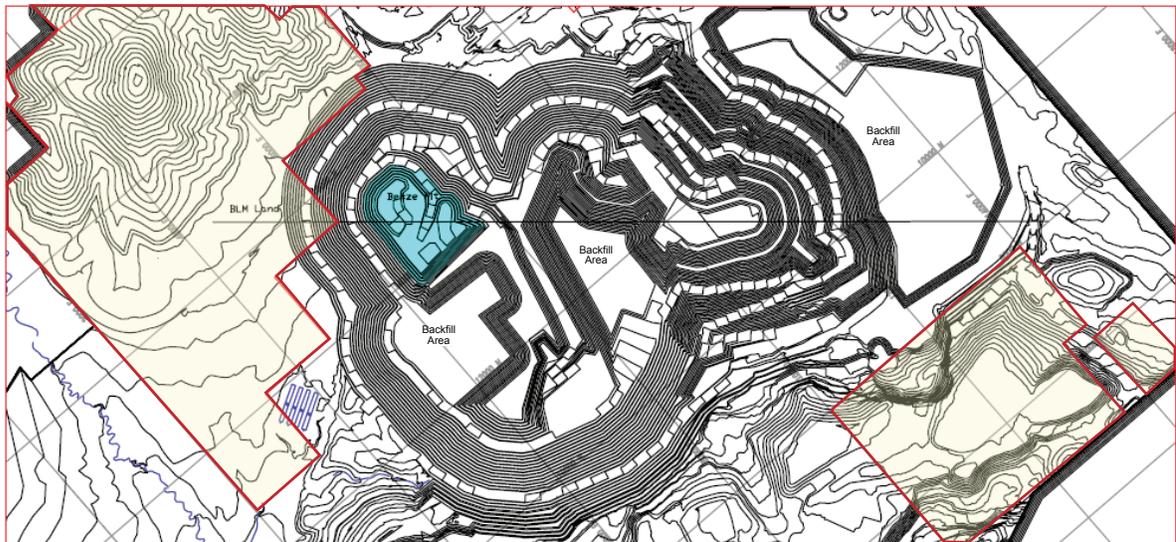
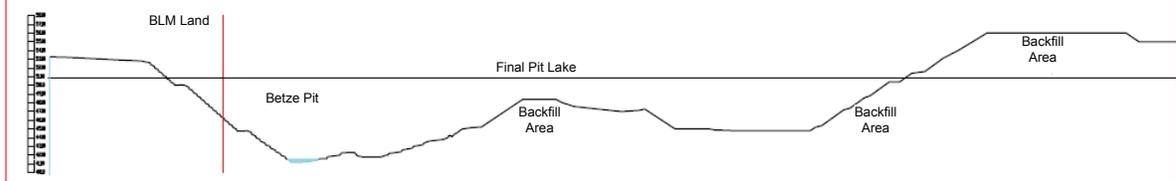
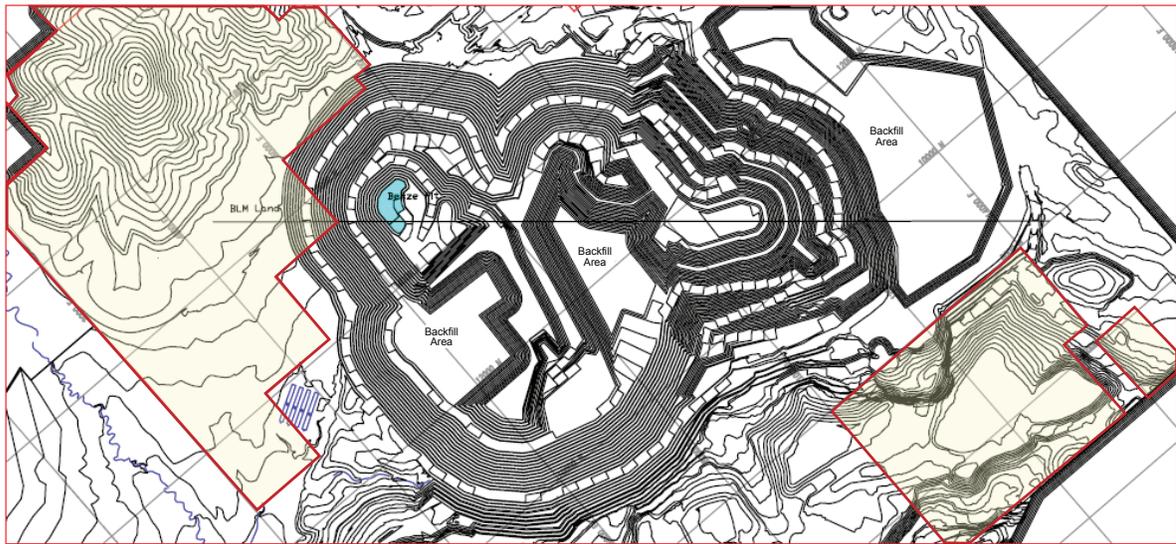
at the NA-37 piezometers in the Tuscarora Mountains, through June 2006, is presented on Figure 7.

Figure 7. Measured and simulated water levels, Tuscarora Mountains



BETZE PIT LAKE FIGURES

APPENDIX C



Legend

- Inundated Areas of the Pit
- Publicly Owned (BLM) Land

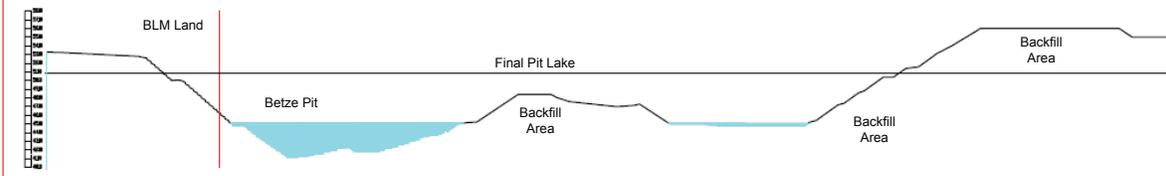
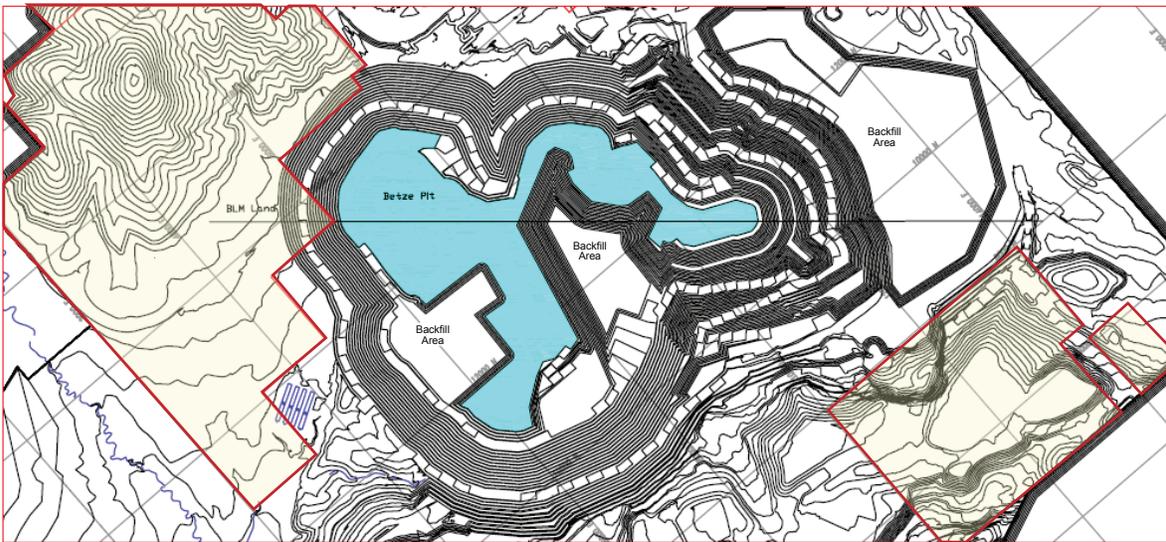
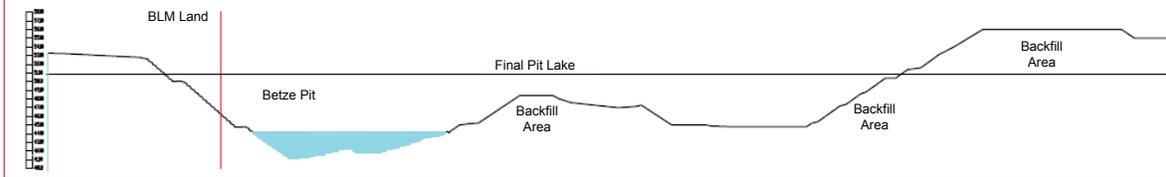
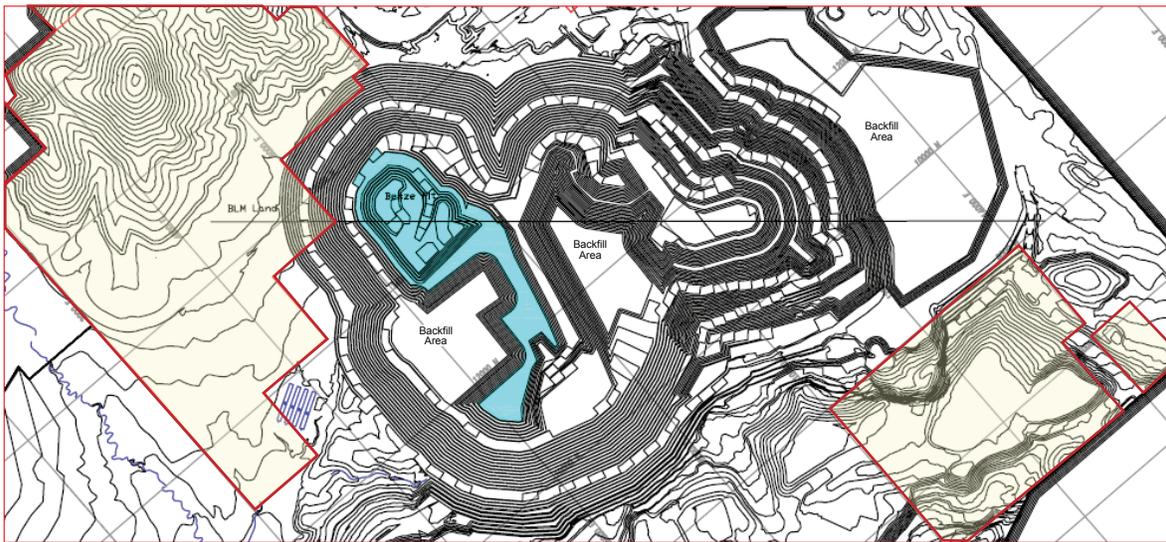


Betze Pit Expansion Project

Figure C-1

Proposed Action
 Betze Pit Lake
 2025 (above), and
 2035 (below)

Source: Schafer 2008b.



Legend

- Inundated Areas of the Pit
- Publicly Owned (BLM) Land

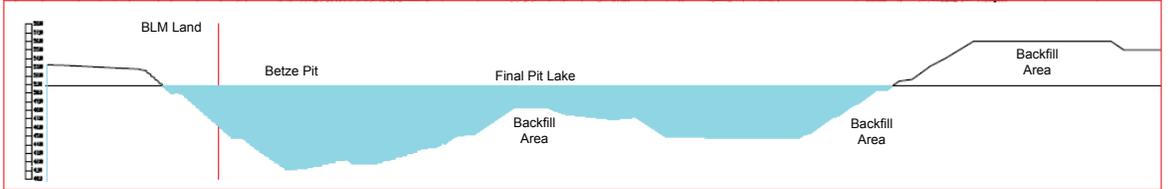
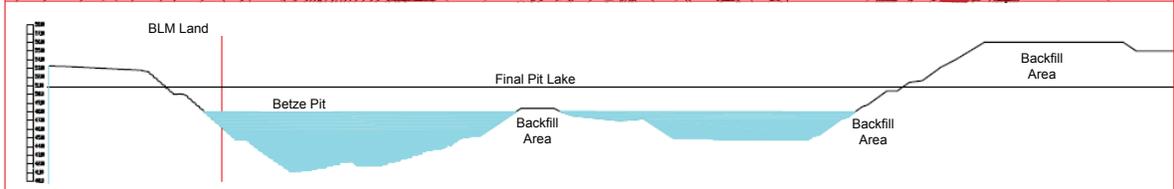
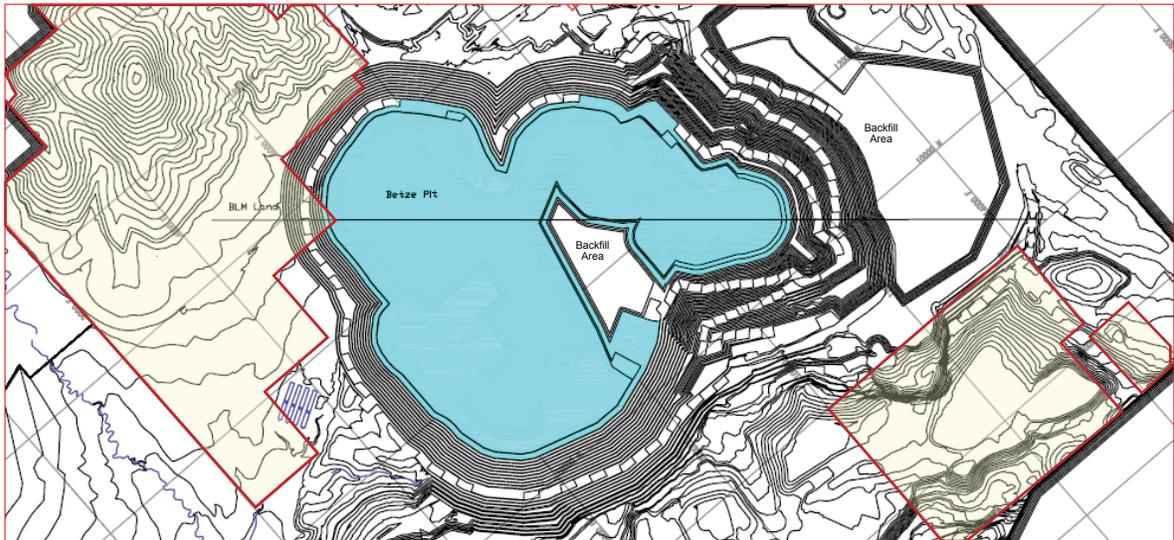


Betze Pit Expansion Project

Figure C-2

Proposed Action
Betze Pit Lake
2045 (above) and
2065 (below)

Source: Schafer 2008b.



Legend

- Inundated Areas of the Pit
- Publicly Owned (BLM) Land



Betze Pit Expansion Project

Figure C-3

Proposed Action
 Betze Pit Lake
 2115 (above) and
 2415 (below)

Source: Schafer 2008b.

CULTURAL RESOURCE INVENTORIES

APPENDIX D

Table D-1 Cultural Resource Inventories Conducted in the Cumulative Effects Study Area

Mine Name	Report Title	Author, Date	BLM Report Number	Sites	National Register Eligibility Recommendation
Barrick Goldstrike Mines	Class III Cultural Resource Inventory in the Ranch Reservoir Area, Eureka County, Nevada	Tipps and Popek 1990	BLM 1-1287 (P)	38 sites/isolates CrNV-12-8005-8009, 8020-8029, 8040-49, 8060-69, 8080-8082	1 eligible site (8022)
Barrick Goldstrike Mines	Class III Cultural Resource Inventory of the Santa Fe Pacific Parcel, Eureka County, Nevada	Schroedel, A. 1990	BLM 1-1323 (P)	15 sites/isolates CrNV-12-8182-8189, 8200-8206	1 eligible site (8185)
Barrick Goldstrike Mines	Class III Cultural Resource Inventory of a Portion of Section 34, T. 36N, R. 49E, Eureka County, Nevada	Popek, G. 1990	BLM 1-1345 (P)	5 sites CrNV-12-7687, 12-8289, 12-8300, 12-8301, 12-7687	None are eligible
Barrick Goldstrike Mines/ Betze Project	An Assessment of National Register Eligibility of 29 Cultural Properties Recorded by Desert Research Institute and P-III Associates, Inc., in the Eastern Portion of the North Block of Barrick Goldstrike Mines, Inc.'s Betze Project, Little Boulder Basin Area, Eureka County, Nevada	Newsome, <i>et al.</i> 1992	BLM 1-1527 (P)	29 sites CrNV-12-7240 CrNV-12-7401, 7402 CrNV-12-7241, 7389 CrNV-12-7405, 7407 CrNV-12-7406, 7409 CrNV-12-7420 CrNV-12-7423, 7424 CrNV-12-7482 CrNV-12-7627 to 7629 CrNV-12-7640 to 7642 CrNV-12-7646, 7647 CrNV-12-7649 CrNV-12-7660 to 7661 CrNV-12-7663 to 7664 CrNV-12-7680 CrNV-12-10507 CrNV-12-10545	Eligible Eligible Not Eligible Eligible Not Eligible Eligible Not Eligible Not Eligible Eligible Eligible
Barrick Goldstrike Mines/Betze Project	Site Specific Data Recovery Plans for Seven Historic Properties in the Heap Leach Facility Area of the Betze Project, Little Boulder Basin Area, Nevada	Zeanah, D. <i>et al.</i> 1992	BLM 1-1548	7 sites CrNV-12-5681, 5682 CrNV-12-7381, 7382 CrNV-12-7404 CrNV-12-8928, 8929	All eligible
Barrick Goldstrike Mines/Little Boulder Basin	Cultural Resource Inventory and Testing in Little Boulder Basin, Eureka County, Nevada: Final Report	Russell, <i>et al.</i> 1986	BLM 1-1042	44 sites CrNV-12-5627-5629, 5640-5649, 5660-5663, 5683-5689, 5700-5709, 5720-5729	4 potentially eligible sites
Barrick Goldstrike Mines/Little Boulder Basin	Site Specific Data Recovery Plan for Six Historic Properties in the North Block Tailings Disposal Facility Area, Phase II, Little Boulder Basin, Nevada	Jones, <i>et al.</i> 1994	BLM 1-1684 (P)	6 sites 26EU1482/1906 26EU1530, 26EU1534, 26EU4696, 26EU5374, CrNV-12-8926	All eligible

Table D-1 Cultural Resource Inventories Conducted in the Cumulative Effects Study Area

Mine Name	Report Title	Author, Date	BLM Report Number	Sites	National Register Eligibility Recommendation
Barrick Goldstrike Mines	Archaic and Numic Encampment in the Little Boulder Basin, Eureka County, Nevada	Tipps 1988	BLM 1-1188 (P)	2 sites 26EU1319 26EU1320	Eligible, mitigated Eligible, tested
Barrick Mine	A Cultural Resources Survey of the Barrick Mine 120 kV Transmission Line Project in Eureka County, Nevada for Sierra Pacific Power Company	Johnson, F. 1987	BLM 1-1126 (P)	2 sites CrNV-12-6382 CrNV-12-6383	Not eligible
Barrick Goldstrike Mines/Little Boulder Basin	Cultural Resource Inventory, Monitoring, and National Register Evaluations in the Little Boulder Basin Area, Nevada	Schroedl and Tipps 1991	BLM 1-1342 (P)	27 sites/7 isolated finds CrNV-12-8922-8929 CrNV-12-8940-8949 CrNV-12-7408 (EK1482) CrNV-12-7421 (EK1483) CrNV-12-7326 (EU1484) CrNV-12-7328 (EU1485) CrNV-12-7344 (EU1486) CrNV-12-7345 (EU1487) CrNV-12-7361 (EU1488) CrNV-12-7365 (EU1489) CrNV-12-7366 (EU1490) CrNV-12-7385 (EU1491) CrNV-12-7440 (EK1492) CrNV-12-7400 (EK4687) CrNV-12-7228 (EK4688) CrNV-12-7403 (EK4689) CrNV-12-7229 (EK4690)	17 eligible sites (CrNV-12-8249, 8923, 8926, 8928, 8929, EUI482-1484, EUI486, EUI487, EUI489-1492, EK4687, EK4688, EK4690)
Betze Project	Cultural Resources Technical Report for the Betze Pit Expansion Project Environmental Impact Statement, Eureka and Elko Counties, Nevada	Burke, T. 1990	BLM 1-1760	75 sites/isolates total CrNV-12 5585-5589, 5600, 5661-5669, 5627-5629, 5640-5647, 5680-5686, 5701-5706, 7303-7309, 7320-7327, 7369, 7381-7384, 7389, 7400-7409, 7229, 7240, 7420-7429, 7440-7446, 7468, 7481-7482	1 eligible site (5682); 37 ineligible, 37 unevaluated
Carlin Gold Mine	Report on an Archaeological Reconnaissance in the Vicinity of James Creek, Eureka County, Nevada	Clerico, R. 1983	BLM 1-682 (P)	17 sites/ 10 isolated finds CrNV-12-3281 through 3289, 12-3300-3309, 3320-3327	12 ineligible, 9 mitigated, 6 unevaluated (see BLM I-727)
Carlin Gold Mine	An Evaluation of Six Archaeological Sites in the James Creek Vicinity, Eureka County, Nevada	Clerico, <i>et al.</i> 1983	BLM 1-727 (P)	6 sites CrNV-12-3285 (EU839); CrNV-12-3304 (EU840); CrNV-12-3305 (EU841); CrNV-12-3309 (EU842); CrNV-12-3320 (EU843-James Creek Shelter); CrNV-12-3326 (EU844)	All eligible

Table D-1 Cultural Resource Inventories Conducted in the Cumulative Effects Study Area

Mine Name	Report Title	Author, Date	BLM Report Number	Sites	National Register Eligibility Recommendation
Carlin Gold Mine	Nevada Department of Transportation Cultural Resources Report SR766 Elko/Eureka County Line to the Carlin Gold Mine	Mathiesen, D. and P. Matranga, 1985	BLM 1-967 (P)	26EU1270	Not eligible
Carlin Gold Mine	Proposed Data Recovery Activities at the James Creek Shelter (26EU843), Eureka County, Nevada	Elston and Budy 1984	BLM 1-1584 (P)	1 site CrNV-12-3320	Eligible, mitigated
Dee Gold Mine	Archaeological Report on the Evaluation of Sites CrNV-12-1986 to 1989 and CrNV-12-2000 to 2004, the Dee Gold Mine, Elko County, Nevada	Ellis, R. 1983	BLM 1-709 (P)	9 sites CrNV-12-1986 to 1989; CrNV-2000 to 2004	8 ineligible; 12-2004 unevaluated
Dee Gold Mine	Cultural Resource Inventory of a 520 Acre Mining Exploration Area and an Access Road for Dee Gold Mining Company, in the Tuscarora Mountains, Elko County, Nevada	Rafferty, K. and L. Blair 1988	BLM 1-1203 (P)	5 sites/ 2 isolates no site numbers	6 ineligible; 1 eligible
Dee Gold Mine	A Cultural Resources Inventory of a 5800' Diversion Ditch for Dee Gold Mining Company in Elko County, Nevada	Johnson, F. 1991	BLM 1-1407 (P)	2 sites CrNV-12-8441 and 12-8442	Not eligible
Dee Gold Mine	A Cultural Resources Inventory of The Waste Dump Expansion Project for Dee Gold Mining Company in Elko County, Nevada	Johnson, F. 1991	BLM 1-1408 (P)	4 sites CrNV-12-8445 to 8447 and EK4831	1 eligible site (EK4831)
Dee Gold Mine	A Reevaluation of Cultural Resources in the Dee Gold Mining Company Waste Dump Expansion Area, Elko County, Nevada	Tipps and Popek 1991	BLM 1-1485 (P)	28 sites/38 isolated finds CrNV-12-10440 to 10449, 10460 to 10469, 10480 to 10487	10 eligible sites (CRNV-12-10440, 10441, 10444, 10449, 10462, 10464, 10465, 10484, 10486, 10487)
Dee Gold Mine	Dee Gold Expansion Project: A Reevaluation of 130 Acres at the Dee Gold Mine in Elko County, Nevada	Newsome, <i>et al.</i> 1992	BLM 1-1521 (P)	7 sites CrNV-12-8729 CrNV-12-10529 CrNV-12-10540, 10543 CrNV-12-10541, 10542 CrNV-12-10544	Eligible Eligible Eligible Not Eligible Not Eligible
Newmont Gold Lower James Creek Area	Class III Cultural Resource Inventory of the Lower James Creek Area, Section 12, T. 33N, R. 51E, Eureka County, Nevada	Popek and Strand 1990	BLM 1-1324 (P)	2 isolated finds	Not eligible

Table D-1 Cultural Resource Inventories Conducted in the Cumulative Effects Study Area

Mine Name	Report Title	Author, Date	BLM Report Number	Sites	National Register Eligibility Recommendation
Newmont Gold Lower James Creek Area	Class III Cultural Resource Inventory of the Lower James Creek Area, Section 14, T. 33N, R. 51E, Eureka County, Nevada	Popek and Schroeld, 1990	BLM 1-1340 (P)	4 sites CrNV-12-8245-8248	None eligible
Newmont Gold	Test Hole and Access Road for Newmont Gold Company, Elko County, Nevada	Brewster, M. 1990	BLM 1-1480 (P)	CrNV-12-8325; CrNV-12-3283	Unevaluated
Newmont Gold	A Cultural Resources Inventory of 60 AC of the Lorri/KL Claim and 5.5 Miles of Linear Transect for a Proposed Pipeline for Newmont Exploration Limited in Eureka County, Nevada	Hause, L. 1991	BLM 1-1501 (P)	3 sites CrNV-12-10422-10424	None eligible
Newmont-Blue Star/Genesis Mine (EA filed 1989)	A Class III Cultural Resources Inventory for the Genesis Blue Star Project, Eureka County Nevada. P-III Associates, Inc.	Birnie, Robert I. 2006	BLM 1-2528(P)	12 sites CRNV-12-7160 CRNV-12-10565 CRNV-12-13732 CRNV-12-13733 CRNV-12-13734 CRNV-12-13735 CRNV-12-13736 CRNV-12-13737 CRNV-12-13738 CRNV-12-13739 CRNV-12-13740 CRNV-12-13741	1 site: CRNV-12-10565
Newmont Mine Leeville Pipeline	Cultural Resource Inventory of Alternative Routes for the Proposed Leeville Dewatering Pipeline, Eureka County, Nevada	Newsome, Daniel K. 2000	BLM 1-1652 (P)	CRNV-12-7162 CRNV-12-10801	1 eligible site (10801)
Newmont-Mike Exploration Project	Class III Cultural Resource Inventory of the Mike Addition, Eureka County, Nevada. BLM report 1-2510(P), P-III Associates, Inc. Salt Lake City, Utah.	Bright, J.R. 2006	BLM 1-2510(P)	6 sites CRNV-12-13647 CRNV-12-13648 CRNV-12-13649 CRNV-12-13650 CRNV-12-13651 CRNV-12-13652	3 eligible sites CRNV-12-13650 CRNV-12-13651 CRNV-12-13652
Newmont Mine	Reassessment of Site Significance for CRNV-12-10801. BLM Elko Field office	Hockett, Bryan 2006	1-2555(P)	CRNV-12-10801	Eligible

Table D-1 Cultural Resource Inventories Conducted in the Cumulative Effects Study Area

Mine Name	Report Title	Author, Date	BLM Report Number	Sites	National Register Eligibility Recommendation
Newmont-Pete Project	Class III Cultural Resource Inventory of the Pete Addition, Eureka County, Nevada. BLM report 1-1935(P), P-III Associates, Inc. Salt Lake City, Utah.	Newsome, Daniel K. 2000	BLM 1-1935(P)	6 sites CRNV-12-11424 CRNV-12-11425 CRNV-12-11427 CRNV-11-10038 CRNV-11-10039 CRNV-11-10050	1 eligible site CrNV-11-11039
Newmont Mine South Operations Area	A Class III Cultural Resources Inventory of 837 Acres in Newmont Mining Corporation's South Operations Area, Elko and Eureka Counties, Nevada	Birnie and Knoll 2006	BLM 1-2397 (P)	9 sites CRNV-12-11507 CRNV-12-11508 CRNV-12-13293 CRNV-12-13294 CRNV-12-13295 CRNV-12-13296 CRNV-12-13297 CRNV-12-13298 CRNV-12-13299	4 eligible sites CRNV-12-11507 CRNV-12-13293 CRNV-12-13294 CRNV-12-13296
Newmont Mine South Operations Area	South Operations Area Project Amendment (SOAPA) (EIS filed 2002)			53 sites total	8 eligible sites CRNV-11-9292 CRNV-11-9293 CRNV-11-9294 CRNV-11-9279 CRNV-11-9290 CRNV-11-9291 CRNV-12-3320
Newmont-High Desert (EA filed 1992)	A Treatment Plan for Historic Site 26EU2505, North-Central Nevada. P-III Associates, Inc. Salt Lake City, Utah.	Schroedl 2006	BLM 1-2530(P)	CRNV-12-12466	Eligible
Newmont Gold Chevas Parcel	Cultural Resource Inventory of the Chevas Parcel, Eureka County, Nevada	Newsome, D. 1992	BLM 1-1628 (P)	18 sites CRNV-12-1840, 6381, 6989, 11063-11069, 11080-11087	None eligible
Newmont Gold	Cultural Resource Inventory and Testing in Section 3, T. 35 N, R. 50 E, Eureka County, Nevada	Stratford, Mary 1996	BLM 1-1636	10 sites 5073-1 through 5073-10	All not eligible
Newmont Gold Bootstrap/Capstone Area	Site-Specific Data Recovery Plan for Five Prehistoric Cultural Properties in the Bootstrap/Capstone Project Area, Upper Boulder Valley, Nevada	Jones, <i>et al.</i> 1996	BLM 1-2024 (P)	5 sites CrNV-12-7345 (EU1487) CrNV-12-7440 (EU1492) CrNV-12-7940 CrNV-12-7368 CrNV-12-7364	All eligible

Table D-1 Cultural Resource Inventories Conducted in the Cumulative Effects Study Area

Mine Name	Report Title	Author, Date	BLM Report Number	Sites	National Register Eligibility Recommendation
Newmont Mine	Class III Cultural Resource Inventory of Portions of Sections 17, 18, 19, 20, and 30, T. 36N, R. 50E, Eureka County, Nevada	Newsome, D. <i>et al.</i> 1993	BLM 1-1684 (P)	6 sites CrNV-12-5585 CrNV-12-5681 (EU1734) CrNV-12-10546 (EU1785) CrNV-12-11260 to 11262	Not eligible Eligible Eligible Not eligible
Newmont Mine Carlin Trend	Cultural Resource Inventory of the Carlin Trend and Valmy Trend Land Exchange Parcels, Elko, Eureka, and Humboldt Counties, Nevada	Newsome <i>et al.</i> 1998	BLM 1-1774 (P)	36 sites/isolates total CrNV-12-11028, 12-11029, 12-11040-11048, 11022-11027, 11047-11048, 11-9078, 11-9098-9099, 11-9110-9113, 12-8245-8247, 12-11344-11349, 12-11360-11362, 12-9776-9779, 12-9790-9791	5 eligible sites (12-11043, 11-9098, 11-9099, 11-9110, 11-9111)
Newmont Mine	Additional Cultural Resource Inventory of the Newmont Gold Company Mill Ore Haul Road and a Portion of the Maggie Creek Drainage, Eureka and Elko Counties, Nevada	Kenzle, S. 1993	BLM 1-1807 (P)	4 sites CrNV-12-11722 CrNV-12-11723 CrNV-12-11724 CrNV-12-11725	Not eligible Eligible Not eligible Eligible
Newmont Mine	Cultural Resource Inventory of the Newmont Gold Company Diversion Channel Extension in Eureka County, Nevada	Kenzle, S. 1994	BLM 1-1888 (N)	None	
Newmont Mine	Cultural Resource Inventory of Section 9, Township 35N, Range 50E, Eureka County, Nevada	Kenzle, S. 1994	BLM 1-1942 (P)	CrNV-12-12023 CrNV-12-12024	Not eligible
Newmont Mine	Cultural Resources Inventory of the Boulder Creek and Dunphy Road Realignment Project Area, Elko County, Nevada	Jones 1994	BLM 1-1947	3 sites 5050-1 and 5050-2 CrNV-12-10448	Eligible Eligible
Newmont Mine	Newmont Explorations Bell Creek Project Cultural Resources Report	Spencer 1985	BLM 1-947 (P)	CrNV-12-5004	Not eligible
Newmont Mine Bootstrap Area	Class II and III Cultural Resource Inventory in the Bootstrap Operations Area, Elko and Eureka Counties, Nevada	Tipps, B. 1989	BLM 1-1268 (P)	83 sites/isolated finds CrNV-12-7965, 7920-7921, 01-7103, 12-7922-7929, 7940-7949, 7960-7964, 7805-7809, 7820-7829, 7840-7849, 7860-7869, 7871, 7880-787889, 7900-7909	3 eligible sites (CrNV-I-7103, 12-7921, 12-7940)
Newmont Mine Bootstrap/ Capstone Area	Cultural Resource Inventory of Private Lands in the Bootstrap/Capstone Area, Elko and Eureka Counties, Nevada	Newsome, D. 1995	BLM 1-1988 (P)	60 sites total CrNV-12-2004 CrNV-12-7103	Not Eligible Eligible

Table D-1 Cultural Resource Inventories Conducted in the Cumulative Effects Study Area

Mine Name	Report Title	Author, Date	BLM Report Number	Sites	National Register Eligibility Recommendation
				CrNV-12-7360 CrNV-12-7364 CrNV-12-7368 CrNV-12-7447 CrNV-12-7842 CrNV-12-7861 CrNV-12-7888 CrNV-12-7903 CrNV-12-7921 CrNV-12-7924 CrNV-12-7929 CrNV-12-7941 CrNV-12-7960 CrNV-12-7962 CrNV-12-7964 CrNV-12-8783 CrNV-12-8923 CrNV-12-10448 CrNV-12-10486 CrNV-12-11166 CrNV-12-11167 CrNV-12-11600 CrNV-12-11626-11627 CrNV-12-11640 CrNV-12-11641 CrNV-12-11644-11645 CrNV-12-11649 CrNV-12-11660 CrNV-12-11664 CrNV-12-12026-12027 CrNV-12-12245-12247 CrNV-12-12248 CrNV-12-12249 CrNV-12-12260 CrNV-12-12261 CrNV-12-12262 CrNV-12-12263-12264 CrNV-12-12265-12266 CrNV-12-12267-12269 CrNV-12-12280 CrNV-12-12281-12285 CrNV-12-12286-12289	Not Eligible Eligible Eligible Eligible Not Eligible Not Eligible Not Eligible Not Eligible Eligible Eligible Not Eligible Not Eligible Not Eligible Not Eligible Not Eligible Not Eligible Eligible Eligible Eligible Eligible Not Eligible Not Eligible Eligible Not Eligible Eligible Eligible Eligible Not Eligible Not Eligible Eligible Eligible Eligible Not Eligible Not Eligible Not Eligible Eligible Not Eligible Eligible Not eligible Eligible Not eligible Eligible Not eligible Eligible
Newmont Mine/ Blue Star Area	Cultural Resource Evaluation of the Blue Star Mine Area in Eureka County, Nevada	Stratford, M. 1994	BLM 1-1944 (N)	None	

Table D-1 Cultural Resource Inventories Conducted in the Cumulative Effects Study Area

Mine Name	Report Title	Author, Date	BLM Report Number	Sites	National Register Eligibility Recommendation
	Right-of-Way for Powerline, Sierra Pacific Power	Dailey, R. T. 1987	BLM 1-1089 (P)	CrNV-6146, 6147	Not eligible
	Archaeological Survey of Access Roads to the Barrick 120 kV Powerline Right-of-Way for Sierra Pacific Power Company	Hubbard, T. 1988	BLM 1-1148 (N)	None	
	Archaeological Survey of Sierra Pacific Power Company's Proposed Ivanhoe 120 kV Extension	McLane, A. 1988	BLM 1-1240 (P)	29 sites (no site numbers)	11 potentially eligible
	Archaeological Inventory of Santa Fe Pacific Mining Company's Proposed Boulder Valley Exploration/Access Road	Young, B. 1989	BLM 1-1248 (P)	CrNV-12-7682, 7683, 7685-7688	None eligible
	Cultural Resource Inventory of Four Road Corridors in the Kinsley Mountains, Elko County, Nevada	Newsome, D. 1992	BLM 1-1290 (N)	None	
	The Schroeder Mountain Road Survey, Cultural Resources Report	Popek and Tipps 1991	BLM 1-1505 (N)	None	
	An Archaeological Survey for the Proposed 120 kV Transmission Line From Coyote Creek to Bazza, Elko and Eureka Counties, Nevada	Botti, <i>et al</i> , 1992	BLM 1-1520 (P)	17 sites total CrNV-12-273/7728 CrNV-12-292 CrNV-12-1736 CrNV-12-4060 CrNV-12-4063-4064 CrNV-12-7443 CrNV-12-10509 CrNV-12-10520-10528	Unknown
	Cultural Resources Inventory Report for a Sierra Pacific Power Co. Transmission Line	Kautz, 1992	BLM 1-1687 (P)	CrNV-12-7360, 7962	Not eligible
	Cultural Resource Inventory of the Maggie Creek Pipeline and Reservoir Area, Eureka and Elko Counties, Nevada	Kice, D. 1992	BLM 1-1722	6 sites CrNV-12-11504-11509	1 eligible site (12-11507)
	An Archaeological Inventory of a Proposed 345/120 kV Transmission Line Between the Valmy, Falcon, an Bell Creek stations in Humboldt, Lander, and Eureka Counties, Nevada	Mariah Associates Inc.	BLM 1-1788 (P)	16 sites CrNV-12-11561-11569, 11580-11584, 11586, CrNV-21-5846	None eligible
	Cultural Resource Monitoring of Six Exploration Drill Sites and an Associated Access Road in Section 12, T. 35N, R. 50E, Eureka County, Nevada	Newsome, D. 1994	BLM 1-1946 (N)	None	

Table D-1 Cultural Resource Inventories Conducted in the Cumulative Effects Study Area

Mine Name	Report Title	Author, Date	BLM Report Number	Sites	National Register Eligibility Recommendation
	Cultural Resources Report for the T Lazy S/25 Corporation Allotment Boundary Fences	King and Vance 1980	BLM 1-284 (P)	CrNV-01-1530	Unevaluated
	Proposed Underground Telephone Cable, Nevada Bell, Cultural Resources Report	Nelson, K. 1980	BLM 1-330 (N)	None	
	Cordex Mining Plan of Operations Cultural Resource Report	Jaynes, S. 1981	BLM 1-484 (P)	9 sites CrNV-12-1986 to 1989; CrNV-2000 to 2004	4 potentially eligible sites
	A Cultural Resource Inventory of the Elko to Carlin Transmission Line, Elko County, Nevada	Gallagher, <i>et al.</i> 1982	BLM 1-642 (P)	2 sites (No Site numbers)	Unevaluated
Western States Minerals	Cultural Resource Inventory in the Little Boulder Basin, Eureka County, Nevada	Schroedl 1986	BLM 1-1040 (P)	6 sites WSM-1 WSM-2 WSM-3 WSM-4 WSM-5 WSM-6	Unevaluated Unevaluated Unevaluated Unevaluated Unevaluated

Source: http://www.blm.gov/pgdata/etc/medialib/blm/nv/field_offices/elko_field_office/programs/nepa/appendices_for_the.Par.3480.File.dat/APPENDIX%20C.pdf

Table D-2 List of Damaged Archaeological Sites within the Barrick Goldstrike POO Boundary¹

Mining Damaged Sites	BLM Number CrNV-12-	BLM 1- Project Number	NRHP Eligibility
EK4740	7103	1203/1268/ 1988	Eligible
EK4659/ EK5914	11166	1202/1642/ 1649	Eligible
EU1485	7328	P-III	Not eligible
EU1486	7344	1244/1342/ 1523/1643	No longer eligible
EU1488	7361	PIII	Eligible site
EU1490	7366	1244/1342/ 1523	Eligible – Surface Collected by P-III & SWCA
EU1522	7368	1244/1523/ 1988	1897 (Eligible – partial mitigation)
EU1533	7420	1244/1527	Eligible
EU1786	10547	1509	Eligible
EU2064	10507	1527/1642	Eligible
EU2432	11601	1800	Eligible
EU2433	11602		Not eligible
EU2452	11641	1800/1988	Eligible
	11624	P-III	Eligible
	11167		Not eligible

¹Mining and exploration activities within the CESA have resulted in cumulative impacts to cultural resources. Recent re-evaluations of many of the remaining cultural resources within the Barrick Goldstrike POO boundary have shown that some of the historic properties that should have been avoided under the PA have been damaged or destroyed.

Source: Fawcett 2008

Table D-3 Mitigated Sites in the Cumulative Effects Study Area

Mine Name	Report Title	Author, Date	BLM Report Number	Sites Mitigated
Barrick Goldstrike Mines	Archaic and Numic Encampment in the Little Boulder Basin, Eureka County, Nevada	Tipps, B. 1988	BLM1-1188(P)	26EU1319/CrNV-12-5588 26EU1320
Barrick Goldstrike Mines	Open Site Archeology in Little Boulder Basin: 1993-1994 Data Recovery Excavations in the North Block Tailings Impoundment Area, North-Central Nevada	Schroedl, A. 1996	BLM1-1614(P)	26EK4687/CrNV-12-7400 26EK4690/CrNV-12-7229 26EK4695/CrNV-12-7401 26EK4696/CrNV-12-7402 26EK5374/CrNV-12-10545 26EU1482/CrNV-12-5664 26EU1483/CrNV-12-7421 26EU1530/CrNV-12-7240 26EU1531/CrNV-12-7407 26EU1534/CrNV-12-5665 26EU1667/CrNV-12-7146 26EU1904/CrNV-12-8926 26EU1906/CrNV-12-8249
Barrick Goldstrike Mines	Data Recovery at the Yaha Site: An Open Prehistoric Camp Site Along Rodeo Creek, Northern Eureka County, Nevada	LaFond, A. 1995	BLM1-1683(P)	26EU1997/CrNV-12-11148
Barrick Goldstrike Mines	Depression Era Quicksilver Mining in Little Boulder Basin: Data Recovery Excavations at Site 26EU1523	Jones, J. 1994	BLM1-1849(P)	26EU1523/CrNV-12-7381
Barrick Goldstrike Mines	Data Recovery Excavations at Site 26EU1494	LaFond, A. 1995	BLM1-2020(P)	26EU1494/CrNV-12-7303
Barrick Goldstrike Mines	Open Site Archeology in Little Boulder Basin: 1992 Data Recovery Excavations in the North Block Heap Leach Facility Area, North-Central Nevada	Schroedl, A. 1995	BLM1-2021(P)	26EU1529/CrNV-12-7404 26EU5200/CrNV-12-8928 26EU1581/CrNV-12-8929 26EU1524/CrNV-12-7382 26EU1734/CrNV-12-5681 26EU1320/CrNV-12-5682
Barrick Goldstrike Mines	Data Recovery Excavations at the Santa Fe Site, Eureka County, Nevada	Schroedl, A. 1994	BLM1-2450(P)	26EU1595/CrNV-12-8185

Table D-3 Mitigated Sites in the Cumulative Effects Study Area

Mine Name	Report Title	Author, Date	BLM Report Number	Sites Mitigated
Barrick Goldstrike Mines	Test Excavation of 5 Sites in Barrick Goldstrike's Expansion, Little Boulder Basin	SWCA 2007	BLM1-2594(P)	26EU1548/CrNV-12-7446 26EU1539/CrNV-12-7426 26EU2126/CrNV-12-11124 26EU2064/CrNV-12-10507 26EU1533/CrNV-12-7420
Barrick Goldstrike Mines	Data Recovery Excavations at Site 26EK4688, Elko County, North-Central Nevada	Birnie, R. 2001	BLM1-2159(P)	26EK4688/CrNV-12-7228
Barrick Goldstrike Mines	Data Recovery Excavations at Site 26EK6487, Elko County, North-Central Nevada	Birnie, R. 2000	BLM1-2052(P)	26EK6487/CrNV-12-9196
Barrick Goldstrike Mines	Report Pending			26EU1785/CrNV-12-10546
Dee Gold Mine	1996 Open Site Archaeology Near Upper Boulder Creek: Data Recovery Excavations at Site 26EK5270, EK5271, and EK5274	Tipps, B. 1996	BLM1-1753(P)	26EK5270/CrNV-12-10440 26EK5271/CrNV-12-10441 26EK5274/CrNV-12-10444
Newmont Genesis/Blue Star Area	Data Recovery Excavations at Site 26EU1505, Eureka County, Nevada	Tipps, B. Stratford, M. 1996	BLM1-1574(P)	26EU1505/CrNV-12-7324
Newmont Genesis/Blue Star Area	Data Recovery Excavations at Site 26EU2124 (CrNV-12-11122)	Stratford, M. 1995	BLM1-2446(P)	26EU2124/CrNV-12-11122
Newmont Genesis/Blue Star Area	Data Recovery Excavations at Site 26EU6232	Schroedl, A. 1996	BLM1-2447(P)	26EU6232
Newmont Genesis/Blue Star Area	Surface Collection, Mapping, and Testing of Site 26EK5278 (CrNV-12-10448)	Schroedl, A. Tallman, D. 1997	BLM1-2448(P)	26EK5278/CrNV-12-10448
Newmont Genesis/Blue Star Area	Two Penny Ridge: Numic Occupation Along Boulder Creek	Schroedl, A. Kenzie, S. 1997	BLM1-2449(P)	26EK6231/CrNV-12-12026
Newmont Genesis/Blue Star Area	Reassessment of Site Significance for CRNV-12-10801	Hockett, B. 2006	BLM1-2555(P)	CrNV-12-10801

Table D-3 Mitigated Sites in the Cumulative Effects Study Area

Mine Name	Report Title	Author, Date	BLM Report Number	Sites Mitigated
Newmont South Operations Area	An Evaluation of Six Archaeological Sites in the James Creek Vicinity, Eureka County, Nevada	Clerico et al. 1983	BLM1-727(P)	26EU839/CrNV-12-3285 26EU840/CrNV-12-3304 26EU841/CrNV-12-3305 26EU842/CrNV-12-3309 26EU844/CrNV-12-3326 James Creek Shelter Tested (26EU843/CrNV-12-3320)
Newmont South Operations Area	The Archaeology of James Creek Shelter	Elston, R. Budy, E. 1990	BLM1-1584(P)	26EU843/CrNV-12-3320 – James Creek Shelter
Newmont South Operations Area	Spring Site Archaeology in the Lower Maggie Creek Area: Data Recovery Excavations at 3 Sites Along Simon Creek	Tipps, B. 1996	BLM1-1773(P)	26EU2181/CrNV-12-11421 26EU2182/CrNV-12-11422 26EU2183/CrNV-12-11725
Newmont South Operations Area	Data Recovery Excavations at Site 26EU2184: A Multicomponent Spring Site in the Lower Maggie Creek Area	Tipps, B. 1997	BLM1-1756(P)	26EU2184/CrNV-12-11428
Newmont Bootstrap Area	Open Site Archaeology: 1996 Bootstrap Data Recovery Excavations	Schroedl, A. 1998	BLM1-1897(P)	26EU1487/CrNV-12-7345 26EU1492/CrNV-12-7440 26EU1520/CrNV-12-7364 26EU1522/CrNV-12-7368
Newmont High Desert	Mitigation of Site 26EU2505 ¹	Birnie, R. 2007	BLM1-2608(P)	26EU2505/CrNV-12-12466

¹Site inadvertently damaged that required subsequent mitigation.

Total number of sites mitigated: 57.

Source: Fawcett 2008.

SPECIAL STATUS SPECIES

APPENDIX E

Table E-1 Special Status Species Identified for the Betze Pit Expansion Project

Common Name/ Scientific Name	Status ¹	Range Habitat Requirements	Potential for Occurrence on or Near the Study Area	Eliminated from Detailed Analysis
MAMMALS				
Pallid bat <i>Antrozous pallidus</i>	BLM; NV-SP	Range: Throughout Nevada. Habitat: Found in a variety of habitats from desert scrub to forests. Roosts in a variety of structures including mines, caves, buildings and trees. Intolerant of roosts in excess of 40°C.	High. This species has been documented southwest of the study area along Rock Creek. Suitable foraging habitat occurs within the study area.	No
Townsend’s big-eared bat <i>Corynorhinus townsendii</i>	BLM; NV-SPS	Range: Throughout Nevada. Habitat: Highly associated with caves and mines. Very susceptible to disturbance at roost sites. Periodically moves to alternate roosts and actively forages and drinks throughout the winter. Typically forages in open forest habitats.	High. This species has been documented east of the study area at abandoned mine shafts in the Lynn Creek drainage. Suitable foraging habitat occurs within the study area.	No
Big brown bat <i>Eptesicus fuscus</i>	BLM	Range: Throughout Nevada. Habitat: Found in a variety of habitats including forests, shrublands, and agricultural and urban areas. Roosts in a variety of structures including mines, caves, buildings and trees. More tolerant of human habitation than other bat species. Roosts in groups up to several hundred individuals.	High. This species has been documented northeast of the study area at Sugarloaf Butte. Suitable foraging habitat occurs within the study area.	No

Table E-1 Special Status Species Identified for the Betze Pit Expansion Project

Common Name/ Scientific Name	Status ¹	Range Habitat Requirements	Potential for Occurrence on or Near the Study Area	Eliminated from Detailed Analysis
Silver-haired bat <i>Lasionycteris noctivagans</i>	BLM	<p>Range: Throughout Nevada but occurs primarily in forest and riparian habitats.</p> <p>Habitat: A forest associated species often found at higher elevations in pinyon-juniper, subalpine fir, aspen and willow habitats. Roosts almost exclusively in trees in the summer. Frequently alternates roost sites. Maternity roost sites are usually in woodpecker holes.</p>	None.	Yes. No suitable habitat occurs within the study area.
Western red bat <i>Lasiurus blossevilli</i>	BLM; NV-SPS	<p>Range: Known from only a few locations in Nevada in Lincoln and Clark counties.</p> <p>Habitat: Found primarily in wooded habitats. Species is a solitary rooster in trees and under leaf litter. Originally thought to only be a migrant in Nevada but small breeding populations may exist in the Fallon and Muddy River areas.</p>	Moderate: Marginal foraging habitat occurs within the study area; however, this species was found during baseline surveys.	No
Hoary bat <i>Lasiurus cinereus</i>	BLM	<p>Range: Patchy distribution throughout Nevada.</p> <p>Habitat: Tree-associated species. Found primarily in forested upland habitats, as well as in forest riparian zones, and agriculture habitats. May occur in park and garden settings in urban areas. A solitary rooster that typically roosts in trees.</p>	Low. Marginal foraging habitat occurs within the study area.	No

Table E-1 Special Status Species Identified for the Betze Pit Expansion Project

Common Name/ Scientific Name	Status ¹	Range Habitat Requirements	Potential for Occurrence on or Near the Study Area	Eliminated from Detailed Analysis
California myotis <i>Myotis californicus</i>	BLM	<p>Range: Throughout Nevada but mainly found in the southern half of the state at lower elevations.</p> <p>Habitat: Found in a variety of habitats from desert scrub to forests. Roosts in a variety of structures including mines, caves, buildings, and trees. Actively forages throughout the winter.</p>	High. Suitable foraging habitat occurs within the study area.	No
Small-footed myotis <i>Myotis ciliolabrum</i>	BLM	<p>Range: Throughout Nevada.</p> <p>Habitat: Found in a variety of habitats from desert scrub to pine-fir forests. Roosts in caves, mines and trees. Forages in open areas.</p>	High. This species was detected south of the study area at the Newmont Mine. Suitable foraging habitat occurs within the study area.	No
Long-eared myotis <i>Myotis evotis</i>	BLM	<p>Range: Throughout Nevada, primarily at higher elevations.</p> <p>Habitat: Primarily a forest-associated species. Roosts in caves, mines and under bridges. May forage within mine and cave structures, gleaning moths from the rock walls.</p>	High. This species has been documented northeast of the study area at Sugarloaf Butte and southwest of the study area along Rock Creek. Suitable foraging habitat occurs within the study area.	No
Little brown myotis <i>Myotis lucifugus</i>	BLM	<p>Range: Found primarily in the northern part of Nevada.</p> <p>Habitat: Found at higher elevations in coniferous forest. Requires a nearby water source. Roosts in trees, buildings, caves, and mines. One of the species most commonly found in human structures.</p>	Low. Marginal foraging habitat occurs within the study area.	No

Table E-1 Special Status Species Identified for the Betze Pit Expansion Project

Common Name/ Scientific Name	Status ¹	Range Habitat Requirements	Potential for Occurrence on or Near the Study Area	Eliminated from Detailed Analysis
Long-legged myotis <i>Myotis volans</i>	BLM	Range: Throughout Nevada but absent from the low desert. Habitat: Piñon-juniper and other higher elevation forest habitats. Night roosts and hibernacula located in caves and mines. Forages in open areas at canopy height.	High. This species has been documented northeast of the study area at Sugarloaf Butte. Suitable foraging habitat occurs within the study area.	No
Yuma myotis <i>Myotis yumanensis</i>	BLM	Range: Found in the western, southern and north-central part of Nevada. Habitat: Found in a wide variety of habitats from low to mid-elevations, including sagebrush, salt desert scrub, agriculture, playa, and riparian habitats. One of the species that is most tolerant of human habitation and one of the few that thrives in a relatively urbanized environment. Roosts in building, trees, mines, caves, bridges and other man-made structures.	High. Suitable foraging habitat occurs within the study area.	No
Western pipistrelle bat <i>Pipistrellus hesperus</i>	BLM	Range: Throughout most of Nevada. More common in the western and southern portions. Habitat: Lower and Upper Sonoran desert habitats of blackbrush, creosote, salt desert shrub and sagebrush, with occasional occurrence in Ponderosa pine and pinyon-juniper, usually in association with rock features such as granite boulders and canyons. Roosts in mainly in rock crevices.	High. This species has been documented southwest of the study area along Rock Creek. Suitable foraging habitat occurs within the study area.	No

Table E-1 Special Status Species Identified for the Betze Pit Expansion Project

Common Name/ Scientific Name	Status ¹	Range Habitat Requirements	Potential for Occurrence on or Near the Study Area	Eliminated from Detailed Analysis
Brazilian free-tailed bat <i>Tadarida brasiliensis</i>	BLM; NV-SP	Range: Throughout Nevada. Habitat: Found in a wide variety of habitats from desert scrub to coniferous forests. Roosts in caves, mines, trees, bridges, and buildings. Colonies often number in the thousands.	Moderate. This species has not been documented in the project region. However, suitable foraging habitat occurs within the study area.	No
Preble's shrew <i>Sorex preblei</i>	BLM	Range: Northern and western Nevada. Habitat: Found in a variety of habitats including arid grassland and shrubland, forest edges, alpine tundra, and wetlands.	High. Suitable habitat occurs within the study area.	No
Pygmy rabbit <i>Brachylagus idahoensis</i>	BLM	Range: Throughout Nevada but limited to areas dominated by sagebrush. Habitat: Requires dense sagebrush for cover as well as appropriate soils for burrowing (i.e., high clay content). Often found in drainages with taller sagebrush present.	High. The study area contains suitable sagebrush habitat.	No
Fletcher dark kangaroo mouse <i>Microdipodops megacephalus nasutus</i>	BLM; NV-SPS	Range: Throughout Nevada. Habitat: Intermountain desert scrub, sagebrush, grasslands and meadows, badlands and dunes, desert playas, and ephemeral pools.	High. Suitable habitat occurs within the study area.	No

Table E-1 Special Status Species Identified for the Betze Pit Expansion Project

Common Name/ Scientific Name	Status ¹	Range Habitat Requirements	Potential for Occurrence on or Near the Study Area	Eliminated from Detailed Analysis
River otter <i>Lontra canadensis</i>	BLM	Range: Northeastern to central-western Nevada. Habitat: Riverine systems and associated marshes, lakes, and ponds.	None.	Yes. No suitable habitat occurs within the study area. The nearest documented records occur along the Humboldt River.
BIRDS				
Least bittern <i>Ixobrychus exilis</i>	BLM	Range: Nests on shallow lakes and wetlands from Sheldon NWR to Ruby Lakes NWR south to Mason Valley WMA in western Nevada. Habitat: Prefers marshes in very fresh water, typically characterized by cattail and/or spikerush. Breeding period is April 15-July 15.	Low. Marginal habitat occurs within the study area.	No
Bald eagle <i>Haliaeetus leucocephalus</i>	NV-E	Range: Throughout Nevada. Habitat: Generally nests and roosts in close proximity to large water bodies including rivers, lakes, and reservoirs. Breeding period is February 15-July-15.	Moderate: Occurrence would be limited to migrating and foraging individuals.	No
Northern goshawk <i>Accipiter gentilis</i>	BLM; NV-SPS	Range: Limited to the northern two-thirds of Nevada. Habitat: Deep conifer-dominated mixed forests. May exhibit seasonal migrations depending on prey availability. Preferred nesting habitat is aspen stands along perennial streams. Breeding period is April 15-August 1.	None.	Yes. No suitable habitat occurs within the study area.

Table E-1 Special Status Species Identified for the Betze Pit Expansion Project

Common Name/ Scientific Name	Status ¹	Range Habitat Requirements	Potential for Occurrence on or Near the Study Area	Eliminated from Detailed Analysis
Swainson's hawk <i>Buteo swainsoni</i>	BLM	Range: Found throughout Nevada, typically in agricultural areas. Habitat: Agricultural valleys and associated uplands. Nests in large shrubs and trees such as cottonwood, willows and aspen. Breeding period is April 1-July 15.	High. Suitable foraging habitat occurs within the study area. No known nests occur within the study area.	No
Ferruginous hawk <i>Buteo regalis</i>	BLM	Range: Throughout Nevada mainly in sagebrush grasslands. Habitat: Dry, open country. Nests usually occur in trees at the interface between piñon-juniper and sagebrush grasslands. Forages over sagebrush grasslands. Breeding period is March 15-July 15.	High. Suitable foraging habitat occurs within the study area. No known nests occur within the study area.	No
Golden eagle <i>Aquila chrysaetos</i>	BLM	Range: Throughout Nevada. Habitat: Mountain or hilly terrain. Nests usually occur on cliffs or in trees. Forages in open country. Breeding period is March 15-July 15.	High. This species has been seen flying near the study area. Suitable foraging habitat occurs within the study area. This species has been documented nesting southwest of the study area along Rock Creek.	No
Peregrine falcon <i>Falco peregrinus</i>	BLM; NV-E	Range: Southwest and extreme southeast Nevada. Habitat: Open country near cliffs. Typically migrates south of U.S. during winter months. Nests on cliffs and rock ledges. Forages in open areas. Breeding period is March 15-July 15.	Low. Marginal foraging habitat is found within the study area.	No

Table E-1 Special Status Species Identified for the Betze Pit Expansion Project

Common Name/ Scientific Name	Status¹	Range Habitat Requirements	Potential for Occurrence on or Near the Study Area	Eliminated from Detailed Analysis
Prairie falcon <i>Falco mexicanus</i>	BLM	Range: Throughout Nevada. Habitat: Dry, open country including desert scrub and sagebrush grasslands. Usually nests on cliffs in proximity to suitable foraging habitat. Breeding period is March 15-July 15.	High. Suitable foraging habitat is found within the study area. This species has been documented nesting southwest of the study area along Rock Creek.	No
Greater sage-grouse <i>Centrocercus urophasianus</i>	BLM	Range: Throughout Nevada in areas with sagebrush. Habitat: Sagebrush grasslands. Leks are located in open areas in close proximity to escape cover. Nests are located in sagebrush habitat, typically within 2 miles of the lek. Broods are raised in wet, grassy areas near sagebrush. Winter habitat consists of south and east facing slopes with minimal snow cover. Breeding period (including displaying, nesting, and fledging) is March 1-July 31.	High. Historically, three leks occurred immediately within the project vicinity. However, two of these leks have been consumed by the Goldstrike Mine in recent years. The third lek is 1.5 miles north of the study area and has not been active since 1989. The nearest active lek occurs approximately 5.5 miles north of the study area. Suitable habitat occurs within the study area.	No

Table E-1 Special Status Species Identified for the Betze Pit Expansion Project

Common Name/ Scientific Name	Status ¹	Range Habitat Requirements	Potential for Occurrence on or Near the Study Area	Eliminated from Detailed Analysis
Sandhill crane <i>Grus canadensis</i>	BLM	<p>Range: Breeds in the lower river valleys and interior basins of the northeastern and east-central regions of Nevada.</p> <p>Habitat: Large irrigated hay meadows, flooded pastures, and grasslands. Also found in agricultural grain fields certain times of the year. Approximately 90 percent of nesting crane pairs is found in Elko County with additional nesting pairs in White Pine, Eureka, Lander, northern Lincoln and Nye, and eastern Humboldt counties. Breeding period is April 15-July 15.</p>	Low. Marginal habitat occurs within the study area.	No
Long-billed curlew <i>Numenius americanus</i>	BLM	<p>Range: A confirmed breeder at Sheldon NWR in northern Washoe County, Ruby Lake NWR in Elko County, Lahontan Valley in Churchill County, and Fish Creek Ranch in Eureka County.</p> <p>Habitat: Prefer closely cropped grasslands, pastures, wet or dry meadows, either on the fringe of a marsh or in a meadow or broad riverine floodplain such as the Humboldt River. Non-breeding feeding areas include irrigated pastures and croplands, shallow wetlands, and newly plowed fields. Breeding period is April 15-July 15.</p>	Low. Marginal habitat occurs within the study area.	No

Table E-1 Special Status Species Identified for the Betze Pit Expansion Project

Common Name/ Scientific Name	Status ¹	Range Habitat Requirements	Potential for Occurrence on or Near the Study Area	Eliminated from Detailed Analysis
Black tern <i>Chlidonias niger</i>	BLM	Range: Nests on shallow lakes and wetlands from Sheldon NWR to Ruby Lakes NWR south to Mason Valley WMA in western Nevada. Habitat: Prefers marshes in very fresh water, typically characterized by cattail and/or spikerush. Breeding period is April 15-July 15.	Low. Marginal habitat occurs within the study area.	No
Burrowing owl <i>Athene cunicularia hypugea</i>	BLM	Range: Throughout Nevada. Habitat: Open country from desert scrub to grasslands. Often found in or around prairie dog colonies. Nests in burrows. Breeding period is April 15-August 15.	High. Suitable foraging habitat occurs within the study area. No known nests have been recorded within the study area.	No
Long-eared owl <i>Asio otus</i>	BLM	Range: Throughout Nevada. Found primarily at higher elevations. Habitat: Juniper woodlands, riparian forests, and coniferous forests. Will often take over old hawk, crow or magpie nests. Breeding period is February 15-July 15.	High. Suitable foraging habitat occurs within the study area. However, roosting and nesting habitat is lacking within the study area.	No
Short-eared owl <i>Asio flammues</i>	BLM	Range: Throughout Nevada. Habitat: Open country from desert-scrub to sagebrush-grasslands. Nests and roosts on the ground. Forages primarily at dawn and dusk. Breeding period is February 15-July 15.	High. Suitable nesting and foraging habitat occurs within the study area.	No

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Common Name/ Scientific Name	Status ¹	Range Habitat Requirements	Potential for Occurrence on or Near the Study Area	Eliminated from Detailed Analysis
Lewis's woodpecker <i>Melanerpes lewis</i>	BLM	<p>Range: A resident breeder in isolated pockets mainly in the northern half of the state.</p> <p>Habitat: During the breeding season, this species prefers open habitats that facilitate its foraging behavior of hawking for insects. This species nest primarily in riparian woodlands. Furthermore, this species prefers areas with a grassy and bushy understory. Breeding period is April 15-July 15.</p>	None.	Yes. No suitable habitat occurs within the study area.
Pinyon jay <i>Gymnorhinus cyanocephalus</i>	BLM	<p>Range: Throughout Nevada.</p> <p>Habitat: Piñon-juniper woodlands. Less frequently found in pine forests and sagebrush grasslands. Distribution is determined by availability of food resources. Nests in loose colonies. Breeding period is April 15-July 15.</p>	None.	Yes. No suitable habitat occurs within the study area.
Juniper titmouse <i>Baeolophus griseus</i>	BLM	<p>Range: Found mainly in piñon-juniper woodlands from Interstate 80 south to the Colorado River.</p> <p>Habitat: Strongly associated with pinyon-juniper woodlands. Snags and heart rot are assumed to be important in providing nesting cavities. Dense foliage and closed canopies are preferred, while thin understory and ground cover are preferred for feeding activities. Breeding period is April 15-July 15.</p>	None.	Yes. No suitable habitat occurs within the study area.

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Common Name/ Scientific Name	Status ¹	Range Habitat Requirements	Potential for Occurrence on or Near the Study Area	Eliminated from Detailed Analysis
Loggerhead shrike <i>Lanius ludovicianus</i>	BLM; NV-SPS	Range: Throughout Nevada. Habitat: Open country including desert scrub and sagebrush grasslands. Nests and forages in brushy areas. Breeding period is April 15-July 15.	High. Suitable nesting and foraging habitat occurs within the study area.	No
Yellow-breasted chat <i>Icteria virens</i>	BLM	Range: Throughout Nevada although more common in the eastern portion of the state. Habitat: Found in cottonwood, willow, riparian and other woodland habitats. Prefer dense understories. Breeding period is April 15-July 15.	Low. Marginal habitat occurs within the study area.	No
Vesper sparrow <i>Pooecetes gramineus</i>	BLM	Range: Nesting has been recorded only in the northern half of Nevada. However, the higher mountain ranges in southern Nevada may provide nesting habitat for the species as well. Habitat: Nests in various open shrub habitats from high elevation valleys to higher mountain slopes and basins. Breeding period is April 15-July 15.	High. Suitable nesting and foraging habitat occurs within the study area.	No

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Common Name/ Scientific Name	Status ¹	Range Habitat Requirements	Potential for Occurrence on or Near the Study Area	Eliminated from Detailed Analysis
Black rosy-finch <i>Leucosticte atrata</i>	BLM	<p>Range: Breeds on the highest mountains of Elko and White Pine counties.</p> <p>Habitat: Breeds and nests in alpine tundra habitat. Nests on high ridges and peaks (9,000 to 13,000 feet in elevation) near rock cover, usually in crevices and holes in cliff sides. Breeding period is May 1-July 15.</p>	None.	Yes. No suitable habitat occurs within the study area.
AMPHIBIANS				
Columbia spotted frog <i>Rana luteiventris</i>	FC; NV-SP	<p>Range: Central (Nye County) and northeast (Elko and Eureka Counties), usually at elevations between 5,600 and 8,700 feet.</p> <p>Habitat: Quiet aquatic habitats including perennial streams, ponds, springs, lakes and marshes. May travel to uplands during wet weather. Females typically lay eggs in late April and May. Tadpoles develop into frogs from late summer to late fall.</p>	Moderate. Known populations exist in the Independence Range to the east of the study area. No known records of this species exist for the study area, although marginal habitat occurs along Boulder Creek.	No

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Common Name/ Scientific Name	Status ¹	Range Habitat Requirements	Potential for Occurrence on or Near the Study Area	Eliminated from Detailed Analysis
Northern leopard frog <i>Rana pipiens</i>	BLM; NV-SP	<p>Range: Isolated habitats throughout Nevada. Absent from the southwest portion of the state.</p> <p>Habitat: Springs, slow streams, marshes, bogs, ponds, canals, flood plains, reservoirs, and lakes; usually permanent water with rooted aquatic vegetation. In summer, commonly inhabits wet meadows and fields. Females typically lay eggs in late April and May. Tadpoles develop into frogs from late summer to late fall.</p>	Moderate. No known records of this species exist for the study area, although marginal habitat occurs along Boulder Creek.	No

¹Status:

FT – Federally Threatened Species

FC – Federal Candidate Species

BLM – BLM Sensitive Species

NV-SP – Nevada State Protected

NV-SPS – Nevada State Protected Sensitive

Source: AGFD 1993; Birds of North America Online 2007; BLM 2007a,b,c,d; BLM 2005, 2002a, 2000a,b; BLM 1991a,b; Bradley et al. 2006; Floyd et al. 2007; Hall 1995; Harvey et al. 1999; Herron et al. 1985; JBR 1996; Johnsgard 1990; Lamp 2007a,b; NatureServe Explorer 2007; Neel 1999; NDOW 2007a; NGS 1983; NNHP 2007; USFWS 2007a,b; USFWS MPR 2007; WAPT 2006.